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REVIEW ARTICLE

PHOTOPERIODISM IN RICE

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INTRODUCTION

Broadly speaking, rice may be regarded as a short-day plant. Although it has received considerable attention by research workers during the last 30 years, there has been little definite information on its photoperiodic reaction. The principal reasons for the many conflicting statements found in the literature are :

(1) A tendency to overlook the influence of non-specific factors on the photoperiodic induction.

(2) Often only a few photoperiods have been compared with each other or with natural day length.

(3) In most experiments the effects of photoperiod at different stages of plant development have not been clearly distinguished.

(4) The quantitative aspect of the photoperiodic response has only rarely been recognized in interpreting experimental data.

For an accurate analysis of varietal behaviour it is necessary to construct response curves based on initiation and flowering, which should cover the range between the attainable photoperiod limits of 4 and 24 hr. While this range may be reduced for practical reasons, it should always include the photoperiod that exercises the greatest influence. Experimentally the course of these curves has been shown to be the most reliable guide to varietal photoperiodic sensitivity.

DEVELOPMENTAL PHASES IN REPRODUCTION

JUVENILE PHASE

The juvenile phase may be considered to start at the date of sowing and to include the early growth stages before the plant responds to photoperiod. Such an insensitive period was recognized by several early Japanese workers (22, 30, 51, 52), and attention has also been paid to this point in later work in Japan and elsewhere (15, 17, 92, 124, 127).

Many experimenters have assumed the existence of this insensitive period, since most day-length treatments were started from 19 to 61 days after sowing, although some Indian publications seem to be at variance with this view. In some experiments short-day treatments in the first weeks after sowing accelerated (104, 105) or delayed (69, 70, 71, 101, 106, 107) the time of heading ; in others long-day treatments accelerated heading (100, 101). These apparent discrepancies may, however, be attributed to non-specific factors. Experiments by Best (15) have shown that short days during the early growth stages whether or not in combination with factors like transplanting, high night-temperatures, excess of nitrogen, cloudy weather, etc., caused less vigorous growth which eventually resulted in delayed flowering. Varieties that are relatively insensitive to photoperiod are usually more influenced by these factors than more sensitive ones, in which non-specific effects are almost completely masked by the photoperiod reaction.

There appear to be varietal differences in the length of the insensitive period (25, 26, 30, 68, 124). If we define that photoperiod which results in the most rapid inflorescence initiation as the " optimum photoperiod", then varieties with a short vegetative period under these conditions also have a short "juvenile phase". Values for the duration of this period range from 14 days in the Japanese variety Eiko to 73 days in the awned Javanese variety Solo, the most usual being 3–5 weeks in many varieties (15).

RIPENESS TO FLOWER

The " juvenile phase " is followed by a stage which may be called " ripeness to flower". It does not seem to be possible to distinguish between the beginning of induction and the visible evidence of initiation in rice, since, as in most plants, both processes seem to be favoured by the same set of conditions. The reproductive stage may be divided into inflorescence initiation, inflorescence development, flowering proper, and development of the grain. The literature on each of these phases will be discussed separately.

INFLORESCENCE INITIATION

The first visible stage of photo-induction, inflorescence initiation, was first studied in Japan. Eguchi (27, 28), in his experiments, considered separately the action of the photoperiod on two developmental phases, i.e. the initiation and the development of the inflorescence. In the varieties examined he found an almost constant interval between the time of initiation and the time of

flowering. Microscopic analysis of the growing point may reveal a change from the vegetative to the reproductive stage within 24 hours, a fact first reported by Noguchi (80, 81). The length of treatment required to induce inflorescence initiation appears to depend on variety, photoperiod and other environmental factors.

Wormer (124), using the Italian variety Nero di Vialone, studied the effect of changing the photoperiod from 12 hr. to 18 hr. (and the reverse) at the moment of inflorescence initiation. A change from 12 hr. to 18 hr. caused various malformations; some growing points returned partially to the vegetative stage. No such effect appeared when the photoperiod was reduced from 18 to 12 hr., when further differentiation of the inflorescence was even accelerated. Best (15) found that the type of response reported by Wormer appeared to occur in some varieties only and then only when specific changes in photoperiod were made. He also showed that, of the possible non-specific factors in inflorescence initiation, temperature was usually the most important, though, particularly when photoperiods were very short, photosynthesis might be restricted. Transplanting, mineral nutrition, water supply, humidity and the physical properties of the soil could also affect the time of initiation.

INFLORESCENCE DEVELOPMENT

The next developmental phase, inflorescence development, is the period between inflorescence initiation and the stage when the panicle and the terminal internode of the culm are fully grown, and in which the further differentiation of the inflorescence and the organization and maturation of individual flower buds take place. Noguchi (80, 81) and Hara (38), found little, if any, effect of photoperiod on inflorescence development, findings later largely confirmed by Tabata *et al.* (113), Eguchi (27, 28), and Wormer (124).

A marked effect of very small differences in the photoperiod was reported by Kerling (48, 49), in the variety Untung, in which differences in day-length of up to 48 min. changed the time of inflorescence development by 3 weeks. Chandraratna (19) found a much less pronounced yet still significant effect of photoperiod on inflorescense development, compared with initiation, in the variety Kohumawi b-11. According to Best (15), varieties differ in their reactions to photoperiod in this developmental phase ; most of them show a small but clearly distinguishable response, others do not react at all, while a few show a marked effect.

ANTHESIS AND GRAIN DEVELOPMENT

In some varieties grown under long photoperiods, anthesis may be less regular than under short photoperiods, and the duration of anthesis in a given panicle, which usually lasts 3–5 days from the first to the last flower, may be extended to 5–8 days. Anthesis in individual flowers often occurs late in varieties very sensitive to the photoperiod, though its duration is little affected. However, very long photoperiods (20–24 hr.) with high-intensity light tend to bring about a protogenic effect. No photoperiodic effect on grain ripening has been established (15).

TYPES OF PHOTOPERIODIC RESPONSE

If inflorescense initiation is taken as the criterion for photoperiodic response over a range of photoperiods between the attainable limits of 4 hr. and 24 hr., photoperiodic response can be expressed in the form of a curve which is obtained by plotting the time from sowing to initiation on the ordinate against the photoperiod used on the abscissa. All curves show an optimum photoperiod (varying between 9–12·5 hr. only) which induces initiation most rapidly. All varieties have a similar type of response, though there is a wide range of quantitative differences between them. In many experiments two or three selected photoperiods only have been used, sometimes with local natural day length as a control. From the shape of the response curves it is evident that when these few photoperiods happen to be located on certain points of the curve, a wrong interpretation of varietal response is likely to be given, and it is therefore not surprising that many conflicting conclusions have been quoted in the literature.

EFFECT OF SHORT DAY

It has been generally established that short photoperiods (from 4 to 12 hr.) hasten initiation, heading or flowering, while long days prolong the vegetative period. These conclusions have been amply confirmed where seasonal differences in day length have been compared.

Some authors report that very short photoperiods between 4 and 8 hr. are less effective in shortening the vegetative period than slightly longer photoperiods (17, 18, 19, 38, 78, 85, 111). In general, these photoperiods have been accepted as being sub-optimal, though different interpretations for this have sometimes been given (1, 32, 56). In some experiments a short-day treatment during the early stages of growth resulted in later flowering in varieties considered locally to be early or medium-early maturing (69, 70, 71, 93, 107), although these results may well have been attributable to a retardation of seedling growth through lack of light.

In several publications it is stated that short-day treatment for a limited period only, applied at early tillering, results in the plant coming into ear twice, or even three times (14, 15, 51, 108, 109, 124). It seems that the main stem, and perhaps some of the oldest laterals, entered the

'ripeness to flower" stage before, or during, the treatment and subsequently reacted to the applied photoperiod. The other tillers were probably less affected, in which case they headed later, or not at all. Transplanting at about the time of inflorescence initiation may cause rapid development of the inflorescence and early flowering. The flowering of tillers formed after transplanting is much delayed and has been reported (47, 116), to be often very irregular.

EFFECT OF LONG DAY

The retarding effect of long photoperiods (13–24 hr.) on floral induction has been described by many workers, yet there is some conflicting evidence (51, 78, 85). An acceleration of flowering, which these workers found under continuous illumination in practically insensitive varieties, may be explained by the domination of a photoperiodic response by the photosynthetic effect of the light. Temperature could also have contributed to this effect.

INDIFFERENT REACTION

An indifferent reaction of certain varieties to photoperiod is also reported (56, 75, 78, 124), although later experiments proved that a slight response to photoperiod is always present (15, 18, 19).

VARIETAL CLASSIFICATION

As early as 1927 and 1929, Yoshii showed varietal differences in response to fixed day lengths. Flowering in the late-maturing variety Shinriki was accelerated by a short photoperiod but not in the early variety Kameno-o. A similar type of response was reported later by other workers (19, 29, 38, 120, 121).

In the USA (2, 14, 43, 44), and in Java (34, 122), sensitivity to photoperiod has not been related to earliness or lateness. Chandraratna (18) mentioned one late variety in Ceylon, which showed little reaction to variations in natural day length, but which appeared to be fairly sensitive under experimental conditions. Best (15) concluded that a correlation between earliness or lateness of varieties and their photoperiodic sensitivity was found more often in the temperate and subtropical zones than in the tropics, but in none of these zones was the correlation absolute.

In addition to earliness and lateness Japanese workers have used several classifications to arrange varieties according to their photoperiodic sensitivity (31, 38, 62, 111, 120, 121). In some of these (62, 120, 121), temperature sensitivity was also taken into consideration. It was shown that photoperiodic sensitivity was not necessarily correlated with temperature sensitivity, and this was later confirmed by Kurita and Yamamura (58) and Best (15).

RESPONSE CURVES

In the first experiments in which a range of photoperiods was used (38, 51), heading was earliest in photoperiods of 8 – 12 hr. Suenaga (111) who studied the effect of day length in the range 7 – 24 hr. showed that the optimum photoperiod, depending on temperature, could be deduced by constructing response curves. In some Japanese varieties Matsuo (61) found the optimum photoperiod to be 12 hr. Where the photoperiod was plotted against the number of days to flowering a progressive extension of the photoperiod produced a sigmoid response curve. This was first reported by Miyabayashi (75).

Chandraratna (18, 19), independently investigated the response of some *indica* varieties and one bulu variety under photoperiods mostly between 8 and 14 hr. The heading and initiation curves obtained in these experiments clearly showed characteristic differences between varieties and a very marked response of some *indica* varieties to photoperiods exceeding 12 hr. Morinaga and Kuriyama (78) studied *japonica* and *indica* varieties but the optima of their date-of-heading response curves were, in general, not clearly distinguishable; high temperatures accelerated heading markedly. Best (15) also used *japonica* and *indica* varieties. In his experiments with photoperiods between 5 and 24 hr. he recorded separately: inflorescence initiation; inflorescence development; anthesis and grain ripening. Special attention was paid to non-specific factors acting on the photoperiod reaction.

INTERRUPTED LIGHT AND DARK PERIODS

Daily interruptions of the photoperiod for some hours cause a delay in heading from a few days to one month (14, 30, 65). Very short light-periods (3–15 min.) during the dark period may markedly affect the time of heading in varieties sensitive to photoperiod (15, 60). The photoperiodic response of the rice plant appears to depend more on the length of the longest uninterrupted dark period than on the sum of either light or dark periods given during the course of 24 hr. (15, 51, 52, 60).

LIGHT INTENSITY

With few exceptions, the intensity of any supplementary artificial irradiation is seldom given. Cho (21) first showed that illumination with supplementary light as weak as 0·1 f.c. during the night could retard the time of ear emergence by nearly 20 days in the *japonica* variety Kameji. In other experiments rice plants appeared to be particularly sensitive to an increase in light intensity between 0 and 10 f.c. (15, 74, 124). With increasing light intensities, the time from sowing to floral initiation is increased at first gradually, then rapidly and then again gradually, giving a sigmoid curve. The lowest light-intensity which is

still photoperiodically active and the shape of the initiation curve depend on the variety and on the photoperiod. Low light-intensities are more effective with long photoperiods and in varieties of high sensitivity. Yet the following developmental phase, inflorescence development, is markedly affected by light intensities in a few varieties only, independently of their photoperiodic sensitivity in respect of floral initiation. The effect of light breaks during the dark period depends on both intensity and duration (15).

WAVE LENGTH DEPENDENCIES

The influence of spectral composition on photoperiodic response in rice has been studied only by Kondo *et al.* (53) and by Best (15). Kondo reported that green light, given as supplementary light, had practically no effect on flowering in rice. Preliminary results of Best's experiments with supplementary light showed that red light was most active, while blue only exerted some effect at high light intensities and in the most sensitive varieties.

PERCEPTION OF THE PHOTOPERIODIC STIMULUS

The perception of the photoperiodic stimulus has received little attention. In Fuke's experiments (31) photoperiodic induction of plants, in which the basal portions (old leaves) were exposed to short photoperiods, was not complete, while perfect induction followed the exposure of all leaves. It seems then that, although the younger leaves are more important in the perception of the photoperiod stimulus, the older leaves also exert some influence ; this was confirmed in later work (15, 118, 119). No single leaf is insensitive and the photoperiodic stimulus may even be perceived by the older leaf sheaths. The response of the plant depends on the action of those leaves which are exposed to that photoperiod which is nearest to the optimum. Complete defoliation may result in floral initiation after 4–5 weeks, even under continuous illumination ; bare green stems of 6- to 8-months-old plants have been shown to be incapable of perceiving the stimulus (15).

INFLUENCE OF NATURAL DAY LENGTH

In the tropics the influence of natural day length on the time of heading in rice has been appreciated for a long time. The old classification of date-fixed and period-fixed varieties, winter and summer varieties, and maha and yala varieties*, is based on this effect, though the origin of the differences in the vegetative periods was not fully understood until the late thirties. Kuilman (56) was probably one of the first to suggest that the slight variations in day length occurring in the tropics could induce differences in the time of flowering in the so-called date-fixed varieties. A few years later Scripčinskiĭ (98, 99), and van der Meulen (63) came to the same conclusion. Chandraratna (17) and Kerling (48) showed in their experiments that this supposition was right.

EFFECT OF SOWING DATE

The type of experiment which is generally used to investigate the influence of natural day length is the date-of-sowing experiment. These experiments are undoubtedly of great importance for the practical grower, but they are not very suitable for research on photoperiodism, since so many specific and non-specific factors affect the normal photoperiodic response.

An analysis of natural day shows that a number of factors may affect its photoperiodic effect. Of these, the most important are : cloudiness, haze and fog (which may affect light intensity), the duration of dawn and twilight periods (which varies with season), and, among non-specific factors, temperature. We can thus distinguish both seasonal and daily changes in day length during the period of flower induction.

Only in the tropics can rice be planted all the year round. Some interesting differences exist in the effect of different sowing dates on the time of heading in regions having the same latitude. For instance, we find that varieties extremely sensitive to photoperiod are planted in Java in December (" long" days), reach maturity and yield well. When planted out of season, " short " days cause premature heading and poor yields (34, 48, 49, 56, 57). In Ceylon and India the situation is just the reverse. Very sensitive varieties are planted in the season with short days and mature early. (Ceylon : (17, 59, 98, 99) ; India : (32, 72, 92). When planted out of season, i.e. under long-day conditions, the vegetative period may be extended to 330 days or even to more than a year, while yield is reduced by sterility and reduced panicle-size. The respective behaviour of sensitive varieties in Java, compared with Ceylon and India, seems to be contradictory. Differences in sensitivity between varieties exist, however, although other factors may contribute to this effect. For instance, the wet monsoon (in which the daily photoperiod is shortened by cloudiness) occurs in the " summer " period in Java, causing day-length differences between the seasons to decline to a certain extent, while the situation in Ceylon and in south-eastern India is just the reverse. Further north, in India, seasonal day length and temperature fluctuations increase, thus altering the photoperiod conditions. From the results of sowing-date experiments on the equator (Pontianak, Borneo), carried out by van der Meulen and Justesen (64), it appeared that the vegetative period of highly sensitive varieties was actually shortened by 36–54 days under the cloudy con-

* yala, S.W. monsoon season; maha, N.E. monsoon season.

ditions of the wet monsoon, compared with the brighter weather conditions of the dry monsoon.

VARIETAL SENSITIVITY

The behaviour of a number of varieties under natural day length points to some adaptation of photoperiodic sensitivity to ecological conditions. The most sensitive varieties from the tropical regions can be grown as a crop only under the day-length conditions of those regions. If transferred to the higher latitudes of non-tropical regions, suitable photoperiodic conditions for floral induction occur too late in the year and the growing season is curtailed by the onset of low winter temperatures. The higher the latitude the shorter the growing season and the longer the photoperiod during the growing season ; this implies that only varieties which are capable of sufficiently early floral initiation under these longer photoperiods are suitable for such conditions. Varieties with responses ranging from almost insensitive to sensitive can be found in all regions. For instance, certain early varieties in Japan and some late awned varieties in Java are practically insensitive, but the most sensitive varieties in Java (tropics) are much more sensitive than the most sensitive varieties in Japan (temperate zone). A few varieties of low photoperiodic sensitivity show a great ecological adaptability, e.g. Fortuna and Blue Bonnet (USA) which can be grown successfully in both the sub-tropics and tropics.

EFFECT OF DAY LENGTH ON YIELD

The most fundamental process which affects yield when rice is grown in different day lengths is photosynthesis. An increase in photosynthesis, produced by a longer vegetative period (to a certain extent), by lengthening the assimilation period per day, or by increasing the assimilation rate (brighter weather), potentially increases the yielding capacity of the plant. The highest yield obtained at experimental stations is about twice as high in the temperate zone as compared with the tropics. The best late varieties outyield the best early varieties. The same varieties of rice grown in the dry monsoon regions (bright weather) may yield up to about 25% better than in the wet monsoon countries (cloudy weather). Also, an increase in daily assimilation enables the plant to take up more nutrients, in particular, nitrogen.

TEMPERATURE

In experimental work on the effect of temperature in rice, differences in temperature conditions were obtained by varying the date of sowing (e.g. 110, 111), by growing plants outdoors and in glasshouses (e.g. 62, 78) or by working under controlled temperature conditions (e.g. 50, 55). In general, temperatures between 29° and 32°C. appeared to be optimal for grain yield and, although higher temperatures (up to 37°C.) generally accelerated growth and heading, they decreased grain yield.

Morinaga and Kuriyama (78) have shown that a delay in heading under low temperatures was, in general, reversed in sub-optimal photoperiods. High temperatures retarded heading, on the whole, in 8-hr. days, but accelerated it if day length was increased above 11 hr. A large number of varieties from Pakistan, India, Burma and Java was included in these experiments. The high-temperature effect under an 8-hr. photoperiod was not confirmed by Wada (121, 122), who worked with Japanese varieties.

Russian workers (9, 35) suggest that the rice plant needs a drop of 1·5°–3°C. in the average daily temperature to be able to convert vegetative into reproductive growth. This drop may be equally effective at any time after germination although Scripčinskiĭ (98) did not share this view. In Japan, more or less the reverse was established. Tanaka and Wada (115) reported that sub-optimal temperatures for flowering, followed by a slight rise in temperature, encouraged flowering more than unchanged temperatures at a somewhat higher level. Guščin (35) also claimed that in photoperiodism the temperature phase was of more importance than the light phase.

A delay in floral initiation caused by low temperatures has been demonstrated by Otani *et al.* (86) and Nagamatsu (79). Otani *et al.* reported that a reaction to the photoperiod was still noticeable under such low temperatures as 20°C. for the whole day, or 15°C. at night. Best (15) found that under controlled temperatures and photoperiods, initiation was, in general, accelerated especially at 27°–29°C. A delay in initiation at lower or higher temperatures was often very marked. The temperature optimum tended to be higher under long photoperiods and lower under short photoperiods (see also Otani *et al.* (86)). According to Best (15), low temperatures markedly retard inflorescence development, and below 22°–25°C. the panicle often fails to emerge completely from the sheath of the flag leaf. The temperature which accelerated inflorescence development most appeared to be of the order of 35°–37°C. Low temperatures (14°–15°C.) could retard anthesis for as much as 11 days but very high temperatures (38°–45°C.) released anthesis often in less than 10 min. Sterility caused by low temperatures during flowering appears to be due mainly to the high susceptibility of matured pollen grains to low temperatures (55, 95).

Low temperatures retard grain maturation (58, 83, 114) but a large diurnal temperature range (cool nights) generally increases grain weight. Temperatures exceeding 30°–32°C. accelerate grain ripening but decrease grain weight.

TEMPERATURE OF IRRIGATION WATER AND NIGHT TEMPERATURES

Enomoto (29) reported a delay in heading, particularly with water temperatures of 25°C. and lower, amounting to one day per 1°C. decrease. Continuous irrigation with water at 20°C. may cause absolute sterility (54), cold-water injury being first noticeable by damage to pollen grains (102). High water-temperatures often accelerated growth and heading (4, 8, 10, 11, 90, 91, 96). Generally, the effect of low night-temperature is less marked, in particular when the diurnal temperature range is large (15, 30, 77). The seedling stage is more sensitive in this respect and large varietal differences may occur (24, 126). With high night-temperatures, heading and grain ripening may be accelerated (66, 85), but an adverse effect on grain yield has been found (5, 11, 66).

OTHER FACTORS

Several other factors may affect the growth rate of the plant during the vegetative and/or the reproductive stages, thus altering the time of floral initiation and heading, without affecting these processes specifically. Often the effect of such factors is greater in varieties with low sensitivity to photoperiod, but with very sensitive varieties the photoperiodic induction becomes of overriding importance for determining the time of flowering.

PHOTOSYNTHESIS AND RESPIRATION

High temperatures increase the respiration rate (73, 125), and this becomes of growing importance as the photoperiods decrease in length. Therefore, lower average temperatures, and in particular lower night temperatures, generally favour increased growth rates and thus accelerate initiation and heading under very short photoperiods (4–9 hr.), while higher temperatures tend to accelerate heading under longer photoperiods (10, 15, 52, 55, 94). Nutrient requirements, especially for nitrogen, appear to be positively correlated with photosynthesis. A fertilizer level beneficial under a given day length may be excessive if the days are shortened (15, 86). Only photoperiods in which the same amount of photosynthetic light is given are fully comparable (124). Prolonged daylight periods during the juvenile phase have been found to accelerate the growth rate. This does not indicate a long/short day requirement for flowering in rice plants, but may simply be a function of the plant being furnished with more energy (15).

HUMIDITY AND DROUGHT

The relative humidity of the air — and the microclimate in general — may exhibit some effect on growth and development (37, 97, 117). Growth, and flowering in particular, may be retarded under very dry conditions. Such conditions may occur in glasshouses and have to be taken into consideration (15).

Dry periods in lowland rice culture markedly decrease the growth rate and affect the time of flowering. Varietal differences in resistance to drought damage exist (67), while differences in soil type may influence this effect. Attempts to induce flowering in rice by drought treatment failed (15). Continuous irrigation with a high water-level during early stages of growth may also depress early growth considerably.

MINERAL NUTRITION

N and P, in particular, have been found to affect the time of flowering. N deficiency retards floral initiation and flowering for a few days only, but excess of N may cause a delay of up to 3–4 weeks (15, 33, 41, 86). An excess of K and/or P does not seem to affect flowering. Deficiencies, however, have generally been found to retard flowering, especially P deficiency, which may delay heading for 2–4 weeks (15, 16, 33). A retardation of growth and ultimately of heading may also be caused by toxic concentrations of minerals such as Mn and Al, or by free H_2S or organic acids (e.g. butyric acid) in the soil solution. An adverse effect on growth rate may also occur if the Eh of the soil is very low.

TRANSPLANTING

Transplanting, especially if root- or leaf-pruning is practised, seriously interferes with the metabolism of the young rice plant and the time of flowering may be delayed for 2–4 weeks. Conditions before transplanting may largely contribute to the degree to which the plant is affected by transplanting. The products of photosynthesis seem to be primarily used to build up a new root system after transplanting (102). This process may also be affected by temperature (15, 34, 40, 121).

SOIL CONDITIONS

The pH of the soil has little effect on the time of flowering (15, 23, 42). Unfavourable physical properties of the soil might retard the growth rate and therefore delay the time of heading (15), but such conditions are not likely to occur in experiments.

VERNALIZATION

In rice, vernalization has been studied both with high- and low-temperature treatments. Low-temperature treatment was investigated in Russia (9, 13, 99), in the Netherlands (84), and in India (3, 39, 45, 46, 100, 109). Pregerminated seeds were in most cases exposed to temperatures of 3°–5°C. for 1–3 weeks. In the Russian experiments and in those of Ossewaarde (83) and Sircar and Parija (109), earlier heading

was reported. In some cases an increase in yield was also claimed (3, 84, 88, 109). All other reports in the literature point to an insignificant or even harmful effect of low-temperature vernalization. Bassarskaja (13), who worked with 3°, 15° and 20°C., found heading to be accelerated least after treatment at 3°C. and concluded from the general trend of the data of her experiments, and from a biochemical test at the vernalization stage (12) that only high temperatures caused vernalization. She explained earlier Russian results by assuming that at low temperatures vernalization may also occur, but at a much slower rate. Most work has been devoted to high-temperature treatments (9, 13, 36, 89, 101, 106). Temperatures from 20°–37°C. have been investigated. In general, earlier heading (mostly 5–12 days) and increased yield have been reported, although the experimental results of Avakiĭan (9) and Scripčinskiĭ (98) showed the opposite effect. Bassarskaja (13) explained these results by pointing to her own observations, according to which prolonged treatment (exceeding 7–14 days, according to variety) with high temperatures (20°–22°C.) may damage the apex of the embryo. Similar observations have, however, not been reported by workers in India, Ceylon and Japan (82), who often worked with considerably higher temperatures. In India increasing resistance to drought (87) and flood (88) as a result of vernalization is also mentioned.

In Ceylon a kind of vernalization treatment is used locally by peasants. Soaked seeds are wrapped in gunny bags or plantain leaves and kept moist for 6–8 days (36 (a), (b)); this results in earlier flowering (36 (c)). Later a similar technique was developed by Ariyanayagam (6, 7) from the method used in India (20) to induce drought resistance in wheat.

The preliminary results of studies by Best (15) showed that during the course of high-temperature treatment of seed hydrolysis of starch is continued, while in a few cases the normal number of 3 leaf primordia is increased to 4 After sowing of treated seeds the high content of soluble sugars in the endosperm can cause more rapid growth of the seedlings in the early stages. The minimum leaf number required for inflorescence initiation is thus reached earlier than in non-treated plants which may affect the time of flowering, though 'vernalization' itself need not be invoked.

PHOTOMORPHOGENESIS

In the literature, data such as length and number of stems, colour of leaves, number of grains per panicle, etc., of plants grown under different photoperiods have often been mentioned. A great number of factors as well as photoperiods were varied in these experiments so that the observed phenomena could have largely been brought about by non-specific conditions. The morphology of plants grown under different photoperiods was extensively studied by Kerling (48, 49) and Wormer (124). The only definite photomorphogenetic phenomenon established up till now is an increase in the presence, and the length, of awns in awned and facultatively-awned varieties (15, 38, 112, 124).

SUMMARY

(1) A clear distinction between specific and non-specific factors in the photoperiod reaction is essential.

(2) In all varieties a photoperiodically-insensitive period exists at early stages of growth, ranging according to variety from 2 to 10 weeks after germination.

(3) Inflorescence initiation should be considered as the basic criterion in photoperiodic induction, for it marks the actual conversion from vegetative growth to reproductive development.

(4) In rice, the type of reaction to photoperiod is basically similar in all varieties, though the degree of sensitivity may vary widely.

(5) The best estimate of varietal response to photoperiod can be deduced from response curves.

(6) In day lengths above the optimum, the rice plant behaves like a short-day plant, but, in sub-optimal photoperiods, as a long-day plant. From the point of view of the practical grower, rice may be classed as a short-day plant.

(7) Varietal differences in response to sub-optimal photoperiods are never very great, but varieties may show extreme differences in response to longer photoperiods.

(8) Varieties very sensitive to photoperiod may react to very low light-intensities. This means that twilight contributes significantly to the length of the photoperiod under natural day length conditions.

(9) The reduction in light intensity caused by cloudy weather may shorten the effective length of natural day appreciably.

(10) In addition to inflorescence initiation, the developmental processes between initiation and anthesis react to the photoperiod. This reaction is marked in few varieties only; other developmental processes are not greatly affected.

(11) The behaviour of the rice plant if the light- or dark-periods are interrupted is governed by the length of the longest continuous dark period. The effect of light breaks is determined by the product of duration and intensity.

(12) The reaction of the rice plant to supplementary illumination, or to light breaks of different wave lengths, indicates an optimum in the red, and a much smaller optimum in the blue, parts of the spectrum.

(13) The photoperiodic effect on yield in rice is

indirect and is determined by the vegetative period and by conditions influencing growth and development, in particular those shortly before and during the reproductive stage.

(14) The most fundamental process which affects yield is photosynthesis. An increase in photosynthesis by longer vegetative period (to a certain extent), longer days, or higher light intensities, potentially increases the yield.

(15) Temperature may significantly affect yield. The longer the dark period, the more marked the temperature effect. Large diurnal temperature ranges with cool nights tend to increase yield.

(16) Varietal differences in response to photoperiod, favourable photosynthetic conditions, temperature, mineral nutrition, water supply, etc. are often very great. Optimal conditions for high yields may therefore vary considerably for each variety.

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FIELD CROPS

CEREALS

WHEAT

See also Abs. 703, 704, 705, 707, 708, 709, 713, 714, 872, 904, 1009, 1016, 1046, 1047, 1071

545 Robinson, D. H. **Wheat.** *Minist. Agric., Fish., Fd, England and Wales* 1958, pp. iv + 34, bibl. in text, London : H.M.S.O., 2s. 6d.

Suitable soils and climate for wheat in England and Wales, and its place in the rotation are discussed. Information is given on : cultivation, manuring, seed rates, seed treatment, time of sowing, harvesting, drying, storage and grain quality. Grazing of winter-sown wheat in spring is discussed. The principal diseases and pests of wheat are described and control measures given. There is also a section on costs and marketing.—A.M.H.

546 Power, J. F. and others. **Spring wheat production and soil and water conservation as influenced by methods of summer fallowing on a Chestnut soil in northeastern Montana.** *Proc. Soil Sci. Soc. Amer.* 1958, **22**, No. 5, 460-3, bibl. 14. [Montana Agric. Exp. Sta., Bozeman]

Under favourable weather conditions, yields of spring wheat were not significantly influenced by any of 5 methods of fallowing employed during the preceding summer. Mould-board ploughing in late spring, followed by fallowing, generally resulted in higher yields of a following wheat crop than did any of the other methods, where growing conditions were unfavourable during the year of cropping. Grain-protein content was slightly lower, and test weight higher, on (a) stubble-mulched than on (b) spring-ploughed fallow. One-way disc cultivation in spring (c), and blade- or chisel-cultivation in autumn (d), followed by fallow, gave grain intermediate in quality between that from (a) and (b). Method (a) gave satisfactory yields and good control of erosion. Method (d) may be of some value for controlling weeds.—R.B.

547 Waite Agricultural Research Institute. **Investigations on forage crops and temporary pasture in four-course rotations with wheat.** *Rep. Waite Agric. Res. Inst. 1956-57* Adelaide, [n.d.], 5–6. [Received Jan., 1959]

Mean yields in all phases of the rotations declined as the experiment progressed. The decrease was least in the wheat crops. Yield variation in wheat was related to the apparent density of the soil. This did not act through differences in the number of plants established, but was related to the rainfall in the month following seedbed cultivations. On heavier soils which suffer severe structural breakdown as a result of cultural treatment, wheat yields are expected to be drastically reduced when more than 3 in. of rain falls in the month after sowing.—A.M.H.

548 Silenko, Z. V. [**Sowing winter vetch with winter wheat in the dry areas of the Stavropol region.**] [Russian] *Zemledelie (Agriculture, USSR)* 1958, **6**, No. 8, 64–5.

The highest yields of green matter were obtained with a mixed sowing of 48 kg./ha. winter wheat and 60 kg./ha. winter vetch [*Vicia sativa*]. This mixture is suitable in the above region for green feed because the growth stages in the two crops almost coincide.—M.H.

549 Sasso, G. L'irrigazione del frumento in relazione alla dose di acqua e alla natura del terreno. [**Wheat irrigation in relation to amount of water and soil type.**] *Atti Cent. naz. mecc. agric., Torino* 1956-7 (1958) **2**, 271–5, bibl. 1, English, French and German summaries.

In a trial on 2 different types of soil in Italy in the spring of 1958, wheat was irrigated during a short drought which affected the crop during its critical stage of earing. In the shallow, sandy, silt soil, one irrigation with 600 cu. m./ha. increased grain yields by 18% and straw yields by 31% over the yields of the non-irrigated controls. On the deep, silty clay soil, irrigation had no effect. [See also *Fld Crop Abstr.* 11 : 4.]—E.B.O.

550 Sasso, G. Risultati di esperienze triennali sulla spaziatura delle file del frumento in rapporto alla concimazione localizzata. [**Results from 3 years' trials on spacing wheat rows in relation to fertilizer placement.**] *Atti Cent. naz. mecc. agric., Torino* 1956-7, (1958), **2**, 259–66, bibl. 26, English, French and German summaries.

The results from trials in 1954–7 showed that the optimal spacing for wheat is 9 cm. between paired rows and 31 cm. between adjacent pairs. Band-placement of NPK fertilizer increased grain yields by 7–10% over that obtained from broadcasting the fertilizer. F. s.—E.B.O.

551 Hayward, P. R. **Winter wheat.** *Rep. exp. Wk Throws 1955–6 and 1956–7*, Little Dunmow, Essex, [n.d.], pp. 4 and 26–8. [Received July, 1958]

In 1955–6, observations of growth characteristics, ear and grain type were made on the varieties Dominator, Milfast, Marne Desprez, Heurtebise and Rudest. Varieties included in a yield trial in 1956–7 were Cappelle Desprez, Later, Hybrid 46, Vilmorin 53, Heurtebise, Rudest, Masters 57, Alter, Panter and Miche. Capelle yielded most, but did not significantly outyield Hybrid 46, Masters 57 and Panter.—A.M.H.

552 Anderlini, R. and Favero, A. Varietà di grano tenero più diffuse in coltura e nuove razze. [**Principal varieties of soft wheat grown in Italy and new varieties.**] *Quad. 2 Ente naz. Sementi elette* 1957, pp. 32, bibl. in text, illus. [Milano, Italy]

In a paper presented to a National Meeting at Vicenza, in 1955, a description is given of 14 old varieties and of the following new varieties: Dragone, Falchetto, R. Forlani, Funone, Funotto, Leonardo, Leone, Produttore, R. 37, S. Marino, S.13, Titano, Verna and Vivenza clavatino.—E.B.O.

553 Téllez, M. R. and García, P. E. Ensayos comparativos de rendimiento de trigos de origen híbridos (1955-56). [**Comparative yield trials with hybrid wheats (1955-6).**] *An. Inst. nac. Invest. Agron.* 1958, **7**, No. 1, 9–60. [Cent. Cerealicult., Madrid]

The varieties Aradi and Canaleja, tested at Vich, Barcelona, for the first time, were best with 2423 and 2220 kg./ha., respectively. The variety Canti yielded well in the southern plateau and at Valladolid, Briviesca (Burgos) and Fuentesaúco (Zamora). Other outstanding varieties were Saria, Floreal, Orgaz and the hybrid 447. [See also *Fld Crop Abstr.* 10 : 832.]—E.B.O.

554 Patil, J. A. and others. **Distinguish Niphad-345 from Niphad-179 wheat.** *Farmer, Bombay* 1958, **9**, No. 7, 17–19, illus. [Agric. Res. Sta., Niphad, Nasik District, Bombay State]

Brief notes are given on the history, morphological characters, yields, and disease resistance of the improved wheat strains Niphad-345 and Niphad-179. The important differences are tabulated. Each was released in 1954 to replace Konphad-25 in areas where this suffers heavily from *Alternaria*. The districts for which each variety is suitable are given.—D.B.

555 Relwani, L. L. and Ganguly, B. D. **Improved system of wheat culture in the Gangetic alluvium.** *Indian J. Agron.* 1958, **2**, No. 3, 167–74, bibl. 36.

Improved varieties recommended for different localities are : N.P. 710, Uttar Pradesh ; N.P. 718, Delhi State, parts of Rajasthan and the Punjab ; N.P. 52, Bihar, East Uttar Pradesh and Madhya Pradesh ; N.P. 701 (early maturing), Bihar and Orissa ; N.P. 770, for high altitudes in the hills of North India and Himachal Pradesh ; N.P. 809, for medium altitudes of 4000–6000 ft. A brief literature review summarizes the practices which have proved satisfactory for the following aspects of cultivation : tillage, sowing rate, irrigation, weed control, interculture, roguing, harvesting and threshing, manuring and fertilizing.—D.B.

556 Villanueva, R. and Llosa, B. C. Super-Helvia, nueva variedad mejorada de trigo [**Super-Helvia, a new improved wheat variety.**] *Bol. trim. Exp. agropec., Lima* 1957, **6**, No. 3, 26–8. [Esta. Exp. Agríc. La Molina, Peru]

The principal characteristics are given of the variety Super-Helvia which in trials over 3 years yielded 3889 kg./ha., on average, while Helvia yielded 3616 kg.—E.B.O.

557 Departamento de Investigación Agropecuaria, Colombia. Investigación agricola en Tibaitatá. Sección de trigo. [**Agricultural investigation at Tibaitatá. Wheat section.**] *Bol. misc. 1 Dep. Invest. agropec.* 1958, pp. 7–11, illus.

There is a programme in Colombia for replacing local wheat varieties with improved varieties. The characteristics are given of 3 new varieties (crosses) which are being multiplied, 2809-2b-4b-3b-1T, 2809-2b-2b-1T and 4765–17b–3t–1B. These 3 varieties, together with Menkemen and Bonza already on the market, are suitable for different areas of Colombia, a country with varied topography and climate.—E.B.O.

558 Ministerio de Agricultura. Guatemala. Servicio Cooperativo Interamericano de Agricultura. Informe anual — 1957. [**Annual report for 1957.**] [n.d.], 91.

A description is given of 2 new improved wheat varieties, 2808 and Lerma 52, which are recommended.—E.B.O.

559 Gouvernement Général, Inspection Générale de L'Agriculture. Algeria. Rapport du Conseil de l'Expérimentation et des Recherches Agronomiques pour 1955. [**Report of the Council for Agronomic Experimentation and Research for 1955.**] Alger, 1957, pp. 269.

Weed control in cereals (wheat, barley, oats), pp. 226–7. In a plot trial at the Central Station, MCPA sodium salt was applied at the rate of 2 kg. pure material per ha. *Sinapis arvensis* and *Raphanus raphanistrum* were susceptible. Many other weed species (mentioned) were fairly susceptible. *Oxalis cernua, Chrysanthemum segetum, Polygonum aviculare* and *Papaver hybridum* were resistant.—E.B.O.

560 Serrano, P. J. L. and Rojas, G. M. Efectos del control químico y del control por competencia en el desarrollo de malezas en trigo (*Triticum vulgare* L.). [**Effects of chemical control and of control by competition on weed development in wheat (*T. vulgare*).**] *Ciencia, Méx.* 1958, **18**, No. 4–6, 58–61, bibl. 5, English summary. [Dep. Parasitol. y Bot., Inst. Tecnol., Monterrey, Mexico]

A study was made of weed populations in wheat plots treated with 2,4-D at 0, 0·5, 1, 1·5 and 2 kg. a.e./ha. The wheat was sown at 80, 100 and 120 kg./ha. The principal weeds were *Parthenium hysterophorus, Helianthus* sp., *Bidens* sp., *Lactuca* sp., *Raphanus raphanistrum* and *Amaranthus* spp. Although

the herbicide controlled the weeds, its effect was masked by competition between weeds and crop. In the plots treated with high rates of 2,4-D (1·5 and 2 kg./ha.) the effect of crop competition on weed control was less apparent than in the plots treated with lower concentrations, but in the plots sown with the highest seed rate the degree of control by 2,4-D was masked by the effect of crop competition. Chemical control and crop competition were, therefore, equally important for controlling weeds. Treatment with 2,4-D was uneconomical under the conditions of this trial. The higher competitive efficiency of the wheat, as compared with the weeds, is attributed to the cold weather prevalent during the trial.—E.B.O.

561 Raw, F. and Potter, C. **Studies on the chemical control of wireworms (*Agriotes* spp.). 2. The direct and residual effects of BHC, DDT, aldrin and chlordane.** *Bull. ent. Res.* 1958, **49**, No. 4, 777–83, bibl. 23. [Rothamsted Exp. Sta., Harpenden, Herts]

In a plot trial in 1951–4 to control wireworms in wheat grown on land which had been under grass for about 50 years, the treatments tested were: BHC 20% γ isomer, seed dressing at 2 oz./bu.; 3·5% BHC dust, combine-drilled, to give a rate of 3·8–4 oz. γ isomer/ac. ; 5% DDT dust, combine-drilled to give 7·5 lb. DDT/ac. ; 1·78% aldrin dust, combine-drilled to give 3·56 lb. aldrin/ac. ; and 5% chlordane dust, combine-drilled to give 5 lb. chlordane/ac. In the year of application when wireworm attack was slight, the plots treated with BHC, aldrin and chlordane, all combine-drilled, gave significantly higher grain yields than the control plots. In the following year when wireworm attack was heavier, residual effects on yield were observed on plots initially treated with BHC, DDT, aldrin and chlordane, combine-drilled. BHC, aldrin and chlordane, showed residual effects on yield in the third year also. These residual effects were closely associated with the effect of the treatments on the wireworm population. No direct, or residual, effect from BHC seed dressing was observed.—E.B.O.

562 Guyer, G. E. and others. **An evaluation of systemic insecticides for control of hessian fly in Michigan.** *Quart. Bull. Mich. agric. Exp. Sta.* 1958, **40**, No. 3, 595–602, bibl. 6.

Both thimet and Bayer 19639 (di-syston) at 0·5 and 1 lb./ac. effectively controlled hessian fly (*Phytophaga destructor*) on winter wheat. Seed treatment was slightly more effective than furrow application. In several of the treatments there was a reduction in stand of wheat and early growth was retarded. Most of the plants recovered completely, and there was an increase in plant vigour, especially in the thimet-treated plots. The addition of arasan to the insecticides for seed treatment decreased their phytotoxicity. The concentration of thimet in wheat plants decreased from 4·9 ppm. at 13 days after sowing to 0·056 ppm. after 44 days. No thimet was detected in plants analysed 57 days after sowing.—R.B.

563 Misra, G. **Photoperiodic response of some newly evolved strains of wheat.** *Bull. Torrey bot. Cl.* 1958, **85**, No. 5, 347–58, bibl. 34. [Ravenshaw Coll., Cuttack, India]

Plants 2, 3, 4 and 5 weeks old of strains R–1 and R–9 of X-ray mutant wheat were subjected to 8- and 24-hr. photoperiods ; plants of the same strains, 8-, 16-, 24- and 32-days old were subjected to similar photoperiods for periods ranging from 8 to 32 days. Long days reduced the period of vegetative growth, and short days lengthened it. The younger the plants were at the beginning of treatment, the more pronounced were these effects. Plants exposed to long-day conditions produced fewer and shorter heads ; grain-setting was poor and the grains were lighter in weight. Short-day conditions resulted in no marked increase in yield compared with controls grown under natural day-lengths. F. S.—R.B.

564 Drozdov, S. N. **The influence of copper on the intensity of photosynthesis in the leaves of spring wheat.** [Russian] *Doklady Akad. Nauk SSSR (Proc. Acad. Sci., USSR)* 1958, **121**, No. 4, 753–4, bibl. 1. [Leningrad Agric. Inst.]

Under the conditions of this test, in which the intensity of photosynthesis was determined by Zeller's method (*Planta* 1951, Vol. 39, p. 500), there was evidence that photosynthetic activity is intensified when the nutrient solution contains Cu (e.g. with a concentration of 1 mg./l. $CuSO_4 \cdot 5H_2O$, intensity of photosynthesis was 1·63 mg.CO_2/dm.^{2} compared with 0·79 in the control without Cu).—M.H.

565 Schmalz, H. Die generative Entwicklung von Winterweizensorten mit unterschiedlicher Winterfestigkeit bei Frühjahrsaussaat nach Vernalisation mit Temperaturen unter- und oberhalb des Gefrierpunktes. [**The reproductive development of winter-wheat varieties having different degrees of winterhardiness, sown in spring after vernalization at temperatures below and above freezing point.**] *Züchter* 1958, **28**, No. 5, 193–203, bibl. 53. [Inst. PflZücht, Univ. Halle-Wittenberg, Hohenthurm, E. Germany]

Fifty-two winter-wheat varieties belonging to 3 classes of winterhardiness (strong, medium, weak) were sown in spring after various vernalization treatments : (a) unvernalized but pre-sprouted (the control) ; (b) vernalized at 1°C. ; (c) vernalized at −3°C. ; (d) daily alternating treatment of (b) and (c). In the successive years 1954–7, the duration of vernalization was 36, 40, 63 and 46 days, respectively. At the beginning of September

all plants (55,311) were examined and placed in one of five classes according to the reproductive stage reached. It could not be confirmed that varieties having different degrees of winter-hardiness reacted differently to the vernalization treatments. Treatment at 1°C. produced a stronger vernalization reaction than at —3°C. Reproductive development of plants after treatment (d) was intermediate between those under treatments (b) and (c). F. Ger. s.—D.B.

566 Dolgušin, D. A. [**Characteristics of phasic development in winter wheat under conditions of autumn sowing.**] [Russian] *Agrobiologija* (*Agrobiology, Moscow*) 1958, No. 3, 19–33, illus. [All-Union Inst. Genetics, Odessa]

The subject is discussed with regard to the transformation of spring types of wheat into winter types. [See also *Agrobiology, Moscow*, No. 4, 1952 (article by Lysenko), and *Fld Crop Abstr.* 10 : 407.] —M.H.

567 Ward, G. M. **Potassium in plant metabolism. Effects of light on the mineral composition of normal and potassium-deficient wheat seedlings.** *Canad. J. Pl. Sci.* 1958, **38**, No. 3, 292–9, bibl. 10. [Canad. Dep. Agric., Ottawa, Ont.]

Normal and K-deficient wheat seedlings were grown in sand culture under controlled conditions in a growth chamber, and harvested after 14 days' growth. Photoperiods of 6, 12 and 18 hr., with a light intensity of 1000 f.c., and a constant photoperiod of 12 hr. with light intensities of 750, 1000 and 1500 f.c., were used. Increased photoperiod resulted in relatively greater increases in dry-weight than in fresh weight in all plant parts. With higher light intensities, more dry matter was produced in leaf-tissue, but not necessarily in stem-tissue. K-deficient plants showed the same trends, but were stunted. Reduction in light intensity or photoperiod resulted in increased levels of K in normal plants. In K-deficient plants no consistent pattern of change in response to photoperiod was evident, but percentage K increased with increasing light intensity. Percentage of P decreased with increasing photoperiod, but to a smaller extent in P-deficient plants than in normal plants. Levels of Ca, Mg, Fe, Cu and Mn were not directly related to illumination. Chlorosis due to K-deficiency showed a correlation with high P/Fe ratios.—D.A.L.

568† Corns, W. G. **Effects of foliage treatments with gibberellin on forage yield of alfalfa, Kentucky bluegrass and winter wheat.** *Canad. J. Pl. Sci.* 1958, **38**, No. 3, 314–19, bibl. 4. [Univ. Alberta, Edmonton]

Foliage of lucerne and of Kentucky bluegrass [*Poa pratensis*] grown in a glasshouse, and of Kharkov winter wheat sown in spring in the field, was treated with GA solution before and/or after the first of 2 harvest dates. Visible elongation of leaves and stems of grass and wheat, but not of lucerne, was induced. Treatments with 200 ppm. GA had no perceptible effect on lucerne weight. Similar treatment of Kentucky bluegrass before the first cut increased fresh- and dry-weight at the first cut and slightly increased the total fresh-weight yield from 2 cuts. Similar treatment with GA followed by one cut at the end of the tests, increased the weight of Kentucky bluegrass as compared with controls cut either once or twice. Treatment after the first cut with 200 or 400 ppm. GA also increased the yield of the grass. GA (36 ppm.) on wheat, harvested once at the end of the experiment, improved forage yield.—D.A.L.

569 Runeckles, V. C. **Phosphate metabolism in leaves. 1. Identification of some phosphorylated compounds in wheat leaves.** *Canad. J. Bot.* 1958, **36**, No. 5, 707–15, bibl. 18, illus. [Dep. Biol., Queen's Univ., Kingston, Ontario]

570 Albareda, J. M. and others. Interacción Ca/K en la absorción de estos elementos por la planta de trigo. 1. Influencia del pH en el desarrollo de la planta de trigo. [**Ca/K interaction in the absorption of these elements by the wheat plant. 1. Influence of pH on the development of the wheat plant.**] *An. Edafol. Fisiol. veg.* 1958, **17**, No. 3, 221–256, bibl. 39, illus., English summary.

The Ca/K interaction was studied in wheat plants grown in hydroponic solutions. Plant analyses showed a different absorption of elements according to the pH of the solutions (range pH 4·8–8·4). The assimilation of Mg, Na and P decreased as pH values approached alkalinity ; K assimilation was highest in neutral solutions ; while there were variations in Ca assimilation, which was not affected by alkalinity. The plants developed best at pH values of 6·6–7·4.—E.B.O.

571 Acharya, C. N. and others. **The chemical composition of the wheat plant as a guide for assessing its manurial requirements. 2. Field experiments.** *J. Indian Soc. Soil Sci.* 1958, **6**, No. 2, 77–86, bibl. 2. [Indian Agric. Res. Inst., New Delhi]

Field experiments carried out on sandy loam soils near Delhi with NP 165 and NP 718 wheat varieties confirmed the results of pot experiments that the chemical composition of the plant at the jointing stage (2 months' growth) was a useful guide for assessing nutrient deficiencies in the crop. An adequate supply of nutrients for high crop-yields was indicated when, at the jointing stage, the dry matter of the above-ground plant parts had the following percentage composition :

N, 3·0–3·5; P_2O_5, 0·6–0·7; K_2O, 3·5–4·0; CaO, 1·2–1·5. In the field trials, the N level at the jointing stage was 1·8–2·0%, which showed that, on Delhi soils the most serious deficiency was N. This could be remedied by top dressings of N fertilizer given at the jointing stage. F. s.—D.B.

572 Kamal, M. A. M. and others. **Study on the effect of certain fertilizer treatments on the biochemical constituents of Egyptian wheat kernel varieties. Effect on the nitrogen content and gluten quality with reference to the weight of kernels.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 2, 127–43, bibl. 24. [Received Nov., 1958]

Grain dry-matter content, 100-grain weight, total-, soluble- and protein-N contents and gluten quality were determined in 4 Egyptian wheat varieties, grown at 3 locations, under 4 fertilizer treatments. The 100-grain weight appeared to be controlled by variety and locality rather than by fertilizer treatments. Total-N content differed significantly between varieties and between locations. The response to fertilizer treatments was significant at the 5% level, but there was no significant effect from adding superphosphate at the 2 levels of ammonium sulphate used. The soluble-N fraction was not affected by N or P fertilization. The protein-N fraction followed the same trend as the total-N. Gluten quality was not affected by location or fertilizer treatments. There was a significant correlation between 100-grain weight and gluten quality.—A.M.H.

573 Kamal, M. A. M. and others. **Carbohydrate fractions in different varieties of Egyptian wheat kernels with reference to the influence of some fertilizer treatments and locations.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 2, 95–109, bibl. 18. [Received Nov., 1958]

The contents of hexoses, sucrose, total soluble sugars, pentosans, hexosans, total polysaccharides and total carbohydrates are tabulated for 4 wheat varieties grown at 3 different locations under 4 fertilizer treatments. Variation between locations was greater than that between varieties.—A.M.H.

574 Kamal, M. A. M. and others. **Crystalloid nitrogen fractions in the different varieties of Egyptian wheats.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1957, **2**, No. 1, 257–69, bibl. 18. [Received Nov., 1958]

Ammonia-, amide-, amino- and peptide-N were determined in the grain of 4 Egyptian wheat varieties. No nitrate-N was found.—A.M.H.

575 Franc de Ferrière, P. Précédents culturaux et rendements en blé. [**Wheat yields in relation to the preceding crop.**] *Potasse* 1958, **32**, No. 257, 149–52, illus.

In field trials in Seine-et-Marne, France, over more than 20 years, the effect of K fertilizers on wheat yields varied according to the preceding crop. Where 150 kg. K_2O was applied annually, highest average wheat yields were obtained after sugar-beet (4490 kg./ha.), the effectiveness of K fertilizers being highest in years with wet winters. The average yield of wheat was 4420 kg./ha. after potatoes when yields were adversely affected by a high winter rainfall, and 3720 kg./ha. after lucerne (yields were not affected by the winter rainfall.) —E.B.O.

576 Norfolk Agricultural Station. **Time of application of fertilizer for autumn-sown wheat.** *Rep. Norfolk Agric. Sta. 1957–8*, Sprowston, 1958, 7–8.

In trials in 1956–8, Cappelle wheat received ammonium sulphate (1·5 cwt./ac.), superphosphate (3 cwt./ac.) and muriate of potash (1·5 cwt./ac.), singly or in various combinations, either on the seedbed or as a top dressing in March. The response to N averaged 6 cwt. grain/ac. The 2 dates of application of N were equally effective, except in 1958, when the spring dressing gave almost 3 times the yield increase given by the seedbed dressing. This difference was attributed to the wet winter of 1957–8. There was no response to P. In 1956 and '57, the average response to the K dressing was 2·2 cwt./ac., but in the presence of N, the response to K was negligible. It is suggested that there is little benefit to be obtained from applying P and K in Oct. or early Nov. to the seedbed where dressings of these have already been given to the preceding crop during the same year. Indications are that, despite previous applications, fertilizer treatments in autumn may be of benefit when sowing is delayed until late Nov. or early Dec., or where wheat follows a ley or a white-straw crop.—A.M.H.

577 Linser, H. Versuch zur Verbesserung der Qualität von Getreide durch Düngung. [**The improvement of cereal quality by means of fertilizers.**] *Qual. Plant. et Materiae veg.* 1958, 3 and 4, 529–49, bibl. 8, French and English summaries. [Landw. Versuchsstat. Steyr der Österreich. Stickstoffwerke A.G., Linz/Donau, Austria]

The results of 6-years' field experiments with wheat and rye showed that the highest yields were obtained from 3-fold split N-applications, combined with high single applications of P and K. These high yields were associated with increased profitability, increased gluten content, and an improvement in baking-quality. The optimum N application was 125 kg. N/ha. F. s.—R.B.

578 Chandnani, J. J. and Kavitkar, A. G. **Studies on the response curve of nitrogen on wheat. Series 2.** *J. Indian Soc.*

Soil Sci. 1958, **6**, No. 2, 105–8, bibl. 4. [Indian Agric. Res. Inst., New Delhi]

On sandy loam soils near Delhi, the optimum economic rate of application of N for NP 718 wheat is 40 lb. per ac. F. s.—D.B.

579 Department of Scientific and Industrial Research, Great Britain. **Hermetic storage of damp grain [wheat].** *Pest Infest. Res., Rep. Pest Infest. Bd 1957*, 1958, 13–14.

The viability of wheat after hermetic storage at various moisture contents and temperatures remained fairly constant for an initial period and then decreased slowly to nil. The length of the initial period ranged from 1 week, for grain with 20·3–22·5% moisture content at 25°C., to 33 weeks for that with 17·3% moisture content at 15°C. The period of decreasing viability varied from 60 weeks, for grain with 17·2% moisture content at 15–26°C., to 6 weeks, for that with 22·5% moisture content at 25°C.—A.M.H.

580 National Institute of Agricultural Engineering. **Rate of deterioration in germination of wheat and barley during storage.** *Rep. N.I.A.E. 1956–7*, Silsoe, Beds, [n.d.], p. 33. [Received July, 1958]

For wheat stored in sacks in 1952, the rate of deterioration, as measured by number of mouldy grains, was affected by moisture content, and by drum and concave settings (i.e. by the degree of grain damage), but the latter was less important when the grain was relatively dry. For barley harvested in 1952 and stored at < 14% moisture content, the germination level after 6 months' storage did not differ significantly from that after 2·5 years' storage, but the drop in germination after this period was particularly rapid for grain that had been harvested with a narrow concave clearance and high moisture content.—A.M.H.

581 Martin, J. E. and others. **Drying wheat and corn [maize] on North Carolina farms.** *Tech. Bull. 128 N. Carolina Agric. Exp. Sta.* 1958, pp. 49, maps 1.

582 Macpherson, J. F. **Wheat costings, 1957 crop. Results from 13 binder-cut crops in West Perthshire.** *Rep. 55 Econ. Dep. W. Scot. Agric. Coll.* 1958, pp. 13.

583 Fabiani, L. **Report to the Government of Yugoslavia on improvement of wheat production.** *Rep. 837 FAO/ETAP* 1958, pp. 12.

This final report contains summaries of previous ones, with comments and recommendations. —V.C.F.

BUCKWHEAT

584 Sugawara, K. **On the injury of buckwheat pistil. Retardation of pistil growth as influenced by day-length.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 4, 269–70, bibl. 4, English summary. [Iwate Univ.]

The growth of the pistil of buckwheat is retarded (and consequently fruit-formation prevented) with increase in day length during the vegetative stage and flower-bud differentiation stage. This retardation with increasing photoperiod is a varietal character in buckwheat. F. Eng. s.—D.B.

585 Sayed, M. D. **A study of the influence of gibberellic acid on *Digitalis purpurea* L. and *Fagopyrum esculentum* Moench.** *Diss. Abstr.* 1958, **19**, No. 4, 779. [Ohio State Univ., Columbus]

Observations are given on the effect of GA on the morphology and contents of glycoside and crude fibre of buckwheat.—P.J.B.

OATS

See also Abs. 559, 651, 702, 703, 704, 705, 707, 708, 741, 1016, 1047

586 Edwards, R. S. **Studies of the growth of cereals on seed-beds prepared by dry-sieving of the soil. 3. The yields of grain and of straw.** *Emp. J. exp. Agric.* **26**, No. 104, 323–43, bibl. 13. [Dep. Agric., Univ. Coll. Wales, Aberystwyth]

The effects of various sowing dates and seedbed treatments on grain and straw yields of S172 winter oats and Spratt Archer spring barley were studied. The number of fruitful culms per plant, number of grains or spikelets (in oats) per head, 1000-grain weight, straw length, N content of barley grain and the tension required to uproot a plant at harvest time, were also measured. The finest seedbed (aggregates < 1 mm.) gave the best yields of grain and straw and the next finest (1 mm. –3·175 mm. aggregates) gave the poorest yields. In oats, the higher yields of grain from fine seedbeds were chiefly made up by larger numbers of fruitful culms per plant and larger numbers of spikelets per head. Part of this effect was probably attributable to the lower plant numbers on the fine seedbeds. In barley, the highest numbers of fruitful culms per plant also occurred on the finest seedbed. There were significant differences in numbers of grains per head in only one year out of three. In two years out of three, barley grown on the finest seedbeds had the highest N content, but in the 3rd year it had the lowest. The effect of time of sowing on winter oats was associated with frost damage. With barley, sowing in April resulted in the highest grain yields and sowing in May the lowest. March sowings gave the largest grain size and lowest N content. Seedbed-consolidation treatments had little measurable

effect on yields. The results are discussed in the light of the climatic and soil-moisture data. [See also *Fld Crop Abstr.* 11 : 164 and 586.]—A.M.H.

587† Instituto Agronômico do Sul, Brazil. A época de semeadura e a produção de forragem verde de aveia em Pelotas, R.S. [**Sowing date of, and production of green forage from, oats in Pelotas, Brazil.**] *Com. 15 Inst. agron. Sul* 1957, pp. 3. [Received Oct., 1958]

The results from trials with fodder oats in Pelotas, Brazil, in 1953–4 and 1956, showed that : (a) oats gave 1–3 cuts depending on sowing date, the period from germination to [the first] cut being about 4 months ; (b) the highest yields of green matter (13,104–15,609 kg./ha., average) were obtained from sowing during 15 Apr.–15 May.—E.B.O.

588 National Institute of Agricultural Engineering. **Swath harvesting of oats and barley.** *Rep. N.I.A.E. 1956–7*, Silsoe, Beds, [n.d.], p. 65. [Received July, 1958]

Continuous weight recorders were used to observe the course of drying in swathed and stooked corn. Swathed corn reached its lowest moisture content after about 7 days, but stooked material took 20 days to reach a comparable moisture content. The overall ripening of swathed material was largely independent of the wetting it received in the swath.—A.M.H.

589 Åkerberg, E., and Persson, P. Svalöfs Extra Klockhavre II. **Svalöf's black oat variety Extra Klock II.** *Sverig. Utsädesfören. Tidskr.* 1958, **68**, No. 1–2, 79–84, bibl. 7, English summary.

This new variety derives from a cross between Stormogul II and Extra Klock I. In yield it cannot compete with the late variety Stormogul II, but compares favourably with other existing black oat varieties. In stiffness of straw it is superior to other varieties. Its outstanding character is the high content of kernel, which is about 2·5% higher than in most other black oats and about 1% higher than in Extra Klock I. F. Eng. s.—G.M.R.

590 Brown, C. M. and others. **Winter oats for southern Illinois.** *Circ. 784 Univ. Illinois Agric. Ext. Serv.* 1958, pp. 16, illus.

591 Purdy, L. H. **Results of seed treatment tests for smut control in naturally infested oats and artificially inoculated oats and barley.** *Pl. Dis. Reptr* 1958, **42**, No. 2, 233–7, bibl. 8. [Washington Agric. Exp. Sta., Pullman]

The results are presented of tests to determine the effectiveness of 18 of the newer seed treatment fungicides for controlling oat and barley smuts (*Ustilago avenae* and *U. hordei*) in the Pacific Northwest. Ext.—P.J.B.

592 Smedgård, G. Havrenematoden måste bekämpas. [**Oat nematode must be controlled.**] *Lantm. Svenskt Land* 1958, **69**, No. 47, 977-8, illus. [Plönninge Lantmannaskola, Halland, Sweden]

The results are given of varietal trials with cereals at Plönninge, in the Halland Province of Sweden, to test their resistance to oat eelworm [*Ditylenchus dipsaci*]. Of 7 oat varieties, Sol II [Sun II] showed a clear superiority over the others, with a mean number of 2·8 cysts per plant, followed by Palu, 4·5 cysts, Blenda, 6·7 and Silver, 9·5 cysts. All 5 barley varieties tested were resistant, with mean cyst numbers per plant of nil for Kungs (Pajbjerg Drost), 0·2 for Kron, and 1·7 for Carlsberg II. With spring wheats, mean cyst numbers were 10·3 for Safir, 16·8 for Svenno and 19·8 for Kärn II. Practical recommendations are made for minimizing the incidence of oat eelworm, including the use of appropriate rotations and the prevention of spread through taking farm machinery from one farm to another.—P.J.B.

593† Paunero, Elena. Las Aveneas españolas. 3. [**The Spanish Aveneae. 3.**] *An. Inst. bot., Cavanilles* 1957, **15**, 377–415, illus.

Information, including descriptions and distribution, is given for *Avena pilosa*, *A. longiglumis*, *A. alba*, *A. strigosa*, *A. fatua*, *A. sterilis*, *A. ludoviciana*, *A. sativa* and *A. byzantina*.—E.B.O.

594 Norden, A. J. **Factors associated with lodging resistance in oats.** *Diss. Abstr.* 1958, **19**, No. 1, 13–14. [Iowa State Coll., Ames]

In 7 oat varieties and 3 oat hybrids, the culm diameter and the cross-sectional area, at a height of 0·5 in. above ground-level were the factors which showed the closest and the most consistent correlation with lodging resistance. There was a significant negative correlation between culm height and lodging resistance. Lodging resistance cannot be completely explained on the basis of height and cross-section. The correlation between yield per panicle and lodging resistance was low. Changes in lodging-resistance measurements of the oat varieties from anthesis to maturity followed closely similar trends. Lodging resistance was strongly influenced by environmental variations.—R.B.

595 Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization. Australia. **Availability of manganese oxide to oats.** *Rep. C.S.I.R.O. 1956–7*, Canberra, 1957, p. 27. [Received Sept., 1958]

Sterile oat plants were found to release substances which dissolved MnO_2. These substances were also present when the plants were grown in sand or Mn-deficient soil. The soil appeared to have a mechanism for rendering the dissolved Mn unavailable.—A.M.H.

596† Ryan, F. E. **Manganese deficiency in oats.** *J. Dep. Agric. W. Aust.* 1958, **7**, No. 5, 571. [Wokalup Res. Sta.]

In trials with 16 varieties of oats and 2 of barley, Kent oats, which are suitable for early grazing, Fulghum, used for grazing and hay, and Avon, used for hay in some districts, were among the least susceptible to Mn deficiency. Atlas and Beecher barley were the most susceptible.—A.M.H.

597 Stenuit, D. and Piot, R. La magnésie, élément essentiel de l'alimentation des plantes. [**Magnesium, an essential element in plant nutrition.**] *Rev. Agric., Brux.* 1958, **11**, No. 3, 401–24, bibl. 20 and No. 6, 897–920, bibl. 3, English and German summaries. [Serv. Pédol. de Belgique, Héverlé]

In field trials in sandy soils in Belgium, with the application of 500–600 kg. of magnesium sulphate (16·8% MgO) per ha. oat yields were 121–97% of the unmanured controls, according to the MgO content of the soil. With soils having the same content of MgO, the effect of a Mg dressing was much greater in a very acid soil than in a slightly acid one. It is concluded that in sandy soils in Belgium, with a low Mg content, the optimal dose of Mg dressing for oats is 100–250 kg. of MgO (600–1500 kg. magnesium sulphate) per ha. [See also *Fld Crop Abstr.* 11 : 492.] F. Fr. s.—E.B.O.

598 Eck, H. V. and Stewart, B. A. **Nitrogen fertilization of winter oats.** *Bull. B–491 Oklahoma Agric. Exp. Sta.* 1957, pp. 11, bibl. 1.

Experimental plots of winter oats were sown in autumn 1952 on land previously cropped with : (a) darso [*Sorghum vulgare* (var.)] for 36 yr.; (b) darso for 36 yr. with *Vicia villosa* as a green manure crop for the last 18 yr. under darso ; (c) oats for 31 yr., cotton for 4 yr., fallow for 1 yr. ; (d) as (c) but with *Vigna sinensis* or *Phaseolus mungo* as green manure crops during the last 18 yr. The oat crops, var. Forkedeer, were grown for 4 yr. with N at 0, 20, 40, 80 and 160 lb./ac./yr. applied during the first 3 yr. During the period prior to 1952, green manuring did not give significant increases in yield of either darso or oats ; moisture appeared to be the limiting factor. In the plots where green manuring had been practised, increases in oat yields were observed during 1953–5. During 1953 soil which had been green-manured provided sufficient available N to produce maximum oat yields, but the residual effect in 1955 was equivalent to less than 20 lb. N/ac. Applied N increased oat yields to the same level on both green-manured and non-green-manured plots. The maximum yield from (a) was obtained with 80 lb. N/ac. The maximum yield from (c) was also obtained with 80 lb. N/ac. but this was not significantly greater than the yield from plots receiving 40 lb. N/ac.—R.B.

599 Haughs, M. A. and Imper, A. D. **Enterprise cost series 1957. Crop costs.** *Econ. Rep. 73 N. Scot. Coll. Agric., Agric. Econ. Dep.* 1958, pp. 8.

This report deals with the costs of production of oats and turnips in the North of Scotland College area.—A.M.H.

RYE

See also Abs. 702, 872, 1016, 1047

600 Hulshoff, A. J. A. Voorloopig verslag over 1957 van Serie 107 (zaadbehandeling en zaadontsmetting bij winterrogge). [**Provisional report for 1957 on Series 107, seed treatment and seed disinfection in winter rye.**] *Gestenc. Versl. Proefsta. Akker. Weidebouw* 1958, No. 56, pp. 7, mimeo. [Phytopath. Service, Wageningen]

The results of 10 trials conducted on sandy and peat-sand soils in different parts of the Netherlands were studied. Seed disinfection with mercury (contained in germisan) or with TMTD had a very favourable effect upon emergence and development of the crop, resulting in an average increase of 10% in grain yield and of 8·5% in straw yield. The results obtained from treatment with mercury and from TMTD were approximately equal. Seed treatment with TMTD + lindane gave an average increase in yield over untreated of *c.* 15%, both in grain and in straw.—G.M.R.

601 Virtanen, A. I. and others. **Formation of benzoxazolinone in rye seedlings.** *Acta chem. Fenn.* (*B*) 1957, **30**, 246. [Found. for Chem. Res., Biochem. Inst., Helsinki] [Received Nov., 1958]

602 Listowski, A. Über den Einfluss der Jarowisation und des Kurztages auf die Entwicklung des Roggens. [**The effect of vernalization and short day on the development of rye.**] *Züchter* 1958, **28**, No. 7, 314–20, bibl. 11. [Inst. PflBau, Düng. u. Bodenkunde, Palawy, Poland]

Short-day treatment of rye plants, which were unvernalized or vernalized for 21 or 42 days, inhibited the development of the reproductive phase and reduced the yield of green matter, whether this treatment was applied at early or later stages of growth. The intensity of inhibition increased with the number of days of short-day treatment. F. s.—D.B.

BARLEY

See also Abs. 559, 580, 586, 588, 591, 592, 596, 702, 703, 704, 705, 707, 708, 709, 713, 910, 1009, 1016, 1047, 1067

603† Jarvis, R. H. and others. **The effect of leys on soil fertility. 2. The effect of undersowing with grasses and legumes on the yield of a barley nurse crop.** *J. agric. Sci.* 1958, **51**, No. 2, 229–33, bibl. 4. [Sch. Agric., Univ. Cambridge]

[See also *Fld Crop Abstr.* 11 : 13.] Abed Kenia barley was undersown with lucerne, a lucerne/cocksfoot mixture, cocksfoot, broad red clover, Italian ryegrass or trefoil, and received 0, 1·5 or 3 cwt. nitro-chalk/ac. There was no evidence that grain or straw yield, 1000-grain weight or N content of the grain were affected in any way by undersowing with any of the spp. used.—A.M.H.

604 Barrow, P. McK. and Webber, G. D. **Better care in harvesting malting barley.** *J. Dep. Agric. S. Aust.* 1958, **62**, No. 2, 66–72, illus.

The type and degree of grain damage which may render barley unsuitable for malting are discussed. Ways of reducing such damage by correct adjustment of harvesting machinery are described.—A.M.H.

605 Barley Committee European Brewery Convention. **Eighth Report of the Barley Committee of the European Brewery Convention. Trials 1957.** Rotterdam, 1958, pp. 138.

The results are given of trials in 13 West European countries, in which the spring-barley varieties Beka, Carlsberg II, Domen, Ingrid and Wisa were compared with Kenia. Other varieties were included in some trials. On average, Wisa and Ingrid gave the highest yields. Carlsberg II had the lowest protein- and N-contents, but these were rather high for all varieties in 1957. Beka showed good malting quality, but low yield and weak straw. Ingrid had a high malt-extract, but low diastatic power and α-amylase content. Wisa had good malting properties.—A.M.H.

606 Departamento de Investigación Agropecuaria, Colombia. Investigación agricola en Tibaitatá. Sección de cebada. [**Agricultural investigation at Tibaitatâ. Barley section.**] *Bol. misc. 1 Dep. Invest. agropec.* 1958, 13–17, illus.

An account is given of work to obtain improved varieties of malting barley. The characteristics are given of those so far obtained : Funza, already widely grown ; Bachué and Tequendama, both of which are being multiplied.—E.B.O.

607 Fischnich, O. and others. Aufhebung der Keimruhe bei Gerste durch Rindite. [**Breaking dormancy in barley with rindite.**] *Landbauforschung* 1958, **8**, No. 1, 4–6, bibl. 5. [Inst. PflBau u. Saatguterzeugung, Braunschweig-Völkenrode, W. Germany]

Using the spring barley Heines Haisa II, the optimal volumes of rindite per kg. grain required for breaking dormancy at different stages of grian ripeness were determined. Allowing 16-hr. treatment at 27°C., the optimum volumes (in cc.) at the various grain-development stages were : green-ripe 0·1, yellow-ripe 0·3, morphologically-ripe 2·7, one-third through the period of dormancy 0·9. The possible applications of this rapid method for breaking dormancy are in seed testing and plant breeding.—D.B.

608 Kinebuchi, M. and others. **Studies on sterility in lower spikelets of barley. 3. Relation between the number of grains per ear and length of top-internode of a culm in barley.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 4, 265–6, bibl. 3, English summary. [Hokuriku Agric. Exp. Sta.]

In barley, a high correlation exists between the length of the highest internode of the culm and the number of sterile spikelets. A top dressing of N, given at flag-leaf emergence, increased the length of the highest internode and decreased the number of sterile spikelets in the lower part of the ear. F. Eng. s.—D.B.

609 Aspinall, D. **Responses of barley to drought.** *Rep. Waite Agric. Res. Inst. 1956–7*, Adelaide, [n.d.], 23–4. [Received Jan., 1959]

Barley, var. Prior, grown in large glazed pots, was subjected to drought treatments during vegetative growth and at definite stages in the flowering and ripening of the plant. The soil in the pots was allowed to lose water, down to the permanent wilting point, and was then rewatered up to field capacity. The number of drought cycles (field capacity to permanent wilting) varied with the treatment. Drought during the vegetative period reduced tillering only slightly. The rate of production of new leaves was markedly reduced at the onset of drought, but their rate of senescence was little affected. Drought treatments reduced number of grains per ear. This was more pronounced in ears which flowered late. Early drought strikingly reduced grain size.—A.M.H.

610 Commonwealth Scientific and Industrial Research Organization. Australia. **Plant nutrition.** *Rep. C.S.I.R.O. 1956–7*, Canberra, 1957, p. 39. [Griffith Res. Sta., N.S.W.] [Received Sept., 1958]

In a glasshouse experiment, two barley varieties, one more salt-sensitive than the other, were treated with NaCl added to the nutrient solution,

There were no changes in relative growth rate during salt treatment, but after the salt was removed the relative growth rate was significantly lower in the salt-sensitive variety than in the other, and lower in both than in the untreated controls. Upon recovery, the relative growth rate of the treated plants was usually higher than that of untreated plants.—A.M.H.

611 Department of Scientific and Industrial Research. Great Britain. **Hermetic storage of damp grain [barley].** *Pest Infest. Res., Rep. Pest Infest. Bd 1957*, 1958, 12–13.

After 81 weeks' storage at 19·2% moisture content in a sealed steel bin, barley grain was normal in appearance but had a slightly sour smell, which largely disappeared during drying, and a slightly abnormal taste. Germination was nil.—A.M.H.

612 May, L. H. **Grain storage.** *Rep. Waite Agric. Res. Inst. 1956–7*, Adelaide, [n.d.], 25–6. [Received Jan., 1959]

In small-scale experiments, barley was stored at 15, 25 or 35°C. in various gas concentrations (0·03, 5 or 10% CO_2 and 2, 10, or 20% O_2). These concentrations had little or no effect on germination. At higher temperatures the % and rate of germination fell slowly. In bulk storage trials lasting 9 months, the grain-moisture content remained within the range 10–12·5%. The germination capacity and germination rate index increased during the first 50 days of storage, remained uniformly high for the next 150–200 days and then decreased again. This decrease was usually associated with an increase in temperature and was more rapid when accompanied by an increase in moisture content.—A.M.H.

613 Pérez-Navarro, A. and Matallana, V. J. Memoria de los trabajos realizados por la sección de cebadas y avenas del Centro de Cerealicultura de Madrid durante el año 1956. [**Report on the work carried out at the barley- and oat-section of the Centro de Cerealicultura of Madrid in 1956.**] *An. Inst. nac. Invest. agron.* 1958, **7**, No. 1, 61–162.

[See also *Fld Crop Abstr.* 10 : 1288.]

MAIZE

See also Abs. 581, 903, 937, 962, 967, 976, 1016

614 Hansen, C. M. and others. **The practicality of plowing for and planting corn in one operation—a preliminary report.** *Quart. Bull. Mich. agric. Exp. Sta.* 1958, **40**, No. 3, 549–54, illus.

A marked reduction in the weed population of maize plots grown in 11 different areas occurred where an experimental machine for simultaneous ploughing and sowing was used. Yields from these plots exceeded those of maize sown conventionally in the same fields by an average of 11 bu. /ac.—R.B.

615 Tanganyika Agricultural Corporation. **Agronomy. Maize.** *Rep. Tanganyika agric. Corp. 1956–7*, Dar-es-Salaam, 1958, 28 and 52–3. [Exp. Fm, Nachingwea and Exp. Fm, Urambo]

At Nachingwea, the relation between date-of-sowing and final yield per ac. was : 2 Jan., 3402 lb. ; 16 Jan., 3076 lb. ; 30 Jan., 1924 lb. ; 13 Feb., 1344 lb. Spacings of 6, 14 and 16 in. in the row gave significantly lower yields than 8, 10 and 12 in. spacings [spacings between rows not given]. At Urambo, responses to 160, 320 and 480 lb. ammonium sulphate/ac. were 1500, 3120 and 3675 lb. clean grain/ac., respectively. Application of more than 320 lb. ammonium sulphate/ac. is unlikely to be economic on a farm scale. The higher levels of N reduced the *Striga* population in the crop considerably.—A.M.H.

616 Ministerio de Agricultura. Guatemala. Servicio Cooperativo Interamericano de Agricultura. Informe anual–1957. [**Annual report for 1957.**] [n.d.], 79–83.

For maize grown in the cold zone, it is recommended that 3 plants of maize should be grown per hill per sq. m. on ridges 15–20 cm. high and 30 cm. wide. By this method moisture is retained in the soil.—E.B.O.

617 Sansom, T. K. **Crop production. Salisbury Experiment Station. Maize.** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1957* Salisbury, 1958, 13–15.

The effect on maize grain-yield of various defoliation treatments applied at flowering, or 3 weeks later, was studied. All treatments reduced yield, but only those involving removal of the top 6 leaves caused significant losses. In another trial, removal of the tassels and the top 3 leaves at flowering reduced yield/ac. by 2·4 bags [1 bag = 200 lb.]. Cutting the stalks above the ears at 15 and 18 weeks after sowing reduced yields by 6·6 and 1·9 bags/ac., respectively. In a spacing × fertilizer trial, in the absence of fertilizer, a 3 × 1 ft. spacing gave the highest yield. Where 250 or 500 lb. ammonium sulphate/ac. was added, a 3 ft. × 9 in. spacing was best. In a trial on ways of using maize stover, ploughing the stalks under gave better yields than leaving them as a mulch on the surface.—A.M.H.

618 Khan, A. R. **Studies on tillage. 4. Effect of frequency of cultivation with and without placement of fertilizers on the yield of maize.** *Indian J. agric. Sci.* 1957, **27**, No. 4, 419–26, bibl. 9. [Indian Agric. Res. Inst., New Delhi]

There were 3 ploughing, 4 hoeing and 3

fertilizer-placement treatments. Interactions between treatments were studied. The highest grain yields were obtained by ploughing twice, hoeing 3 times during growth and placing fertilizer by the plough-sole method. Frequency of ploughing (2, 4 or 6 times) had practically no effect on maize yield.—D.B.

619 Hashad, M. N. and Omar, M. A. **The residual effect of fertilized wheat on following maize.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 199–207, bibl. 10. [Fac. Agric., Ain Shams Univ., Cairo, Egypt] [Received Nov., 1958]

Ploughing-in wheat stubble just before sowing maize, so that the soil and stubble residues were left dry for several weeks, gave better maize yields than ploughing-in the wheat stubble immediately after harvest and irrigating to promote rotting of the stubble. Neither P nor N application to the wheat had any effect on subsequent maize yields. —A.M.H.

620 Department of Agriculture, Nyasaland. **A summary of some aspects of agricultural experimental work, 1957/58. Maize experiments.** *Nyasaland Fmr For.* 1958, **4**, No. 3, 4–5.

Growing maize directly after a grass ley is not recommended unless large dressings of N can be applied to the maize. In a spacing trial, increasing the population above 14,520 plants/ac. gave no further increase in yield. Spacings of 3 ft. × 3 ft. × 3 plants or 3 ft. × 1 ft. × 1 plant, giving populations at harvest of about 12,000 and 14,000 plants/ac., respectively, are recommended. On nearly all the soil types tested, there were large responses to N and practically no response to P. On a poor sandy clay loam at Chitedze, 5 tons farmyard manure/ac. gave an increase of 5 bags grain/ac. [? 1 bag = 200 lb.] in the year of application and 2·5 bags grain/ac. in the year after. The beneficial effects of early sowing (18/19 Nov.) and early weeding (8 and 14 Jan.) on yields were demonstrated. Burning was one of the easiest and most effective ways of disposing of maize stover and weeds, but plots on which stover had been buried tended, in time, to produce better yields. Stover used as a mulch encouraged disease and did not increase yields.—A.M.H.

621 Stickler, F. C. **Dry matter and nitrogen production by legume associations as related to corn yields.** *Diss. Abstr.* 1958, **19** No. 3, 405–6. [Iowa State Coll., Ames]

In green-manure trials in Iowa, total N yields were highest for sweet-clover [*Melilotus* sp.], with a range of 111 to 188 lb./ac., followed by non-winter-hardy lucerne, with a range of 15 to 146 lb./ac. Among sweet-clover varieties, highest N yields were given by Madrid [*M. officinalis*], followed by the annual varieties Israel and Hubam [*M. alba* var. *annua*]. No legume association gave higher yields than Madrid grown alone. Clipping drastically reduced the dry-matter and N yields of Madrid, but increased those of the other legumes. The mean elemental N equivalent of 19 legume green-manure crops was 34 lb./ac. as shown by the response from 1st-year maize and 64 lb./ac. for 2nd-year maize. Applied inorganic N was 2 to 6 times more available than was organic N from green-manure crops.—P.J.B.

622 Laĭter, D. S. [**Experiments on growing maize for seed in central Kazahstan.**] [Russian] *Agrobiologija* (*Agrobiology, Moscow*) 1958, No. 3, 108–12. [Karagandinsk Agric. Exp. Sta.]

In recent years the area sown with maize in central Kazahstan has greatly increased. Maize is one of the basic fodder crops in that region, although it is mostly grown for grain. When grown for grain, the crop should be irrigated. Cultural measures are outlined. In the Karagandinsk Province after the first frosts (−2 or −3°C.) of Aug./Sept. the warm period which usually follows facilitates cob ripening, although the leaves may have been damaged by cold. The severe frosts of Sept./Oct. lower the germination capacity of seed. Harvesting maize for silage should be completed by 25 Aug., and for seed (in dry weather) by 25 Sept. For seed, the crop should be grown preferably where there is liman irrigation [see *Herb. Abstr.* 27 : 790] or on non-saline soils where the ground-water level is high.—M.H.

623 Collier, J. W. **An evaluation of certain factors that affect corn yields in the Blackland Prairie region of Texas.** *Diss. Abstr.* 1958, **19**, No. 2, 203. [Rutgers Univ.]

Applications of N and K resulted in no consistent maize-yield increases on account of inherently high soil fertility and recurrent adverse climatic conditions. Small but fairly consistent yield increases resulted from P applications, and small responses were obtained from N + P under exhaustive cropping. The most satisfactory results without irrigation were obtained with populations of 7000–9000 plants/ac. Excellent maize yields were obtained following cropping with sweet clover [*Melilotus* sp.] or a combination of sweet clover and cereals other than maize. Highest yields, both with and without irrigation, were obtained following sweet clover without added N. Over a 40-yr. period, maize yields showed a highly significant positive correlation with the June mean relative humidity, number of rainy days in June and total June rainfall, and a negative correlation with June maximum temperature and evaporation. June maximum temperature had the dominant effect. Yield was also associated with rainfall before silking and maximum temperatures after silking. The

combination of rising temperatures and low rainfall during and after silking in most years were the factors limiting maize yields, especially in the northern part of the area where low temperatures following emergence prevented rapid growth and development. Suitable plant populations of early-maturing hybrid maize following P- fertilized sweet clover with or without other cereals are expected to produce consistently higher yields.—R.B.

624 Schwab, G. O. and others. **Research on irrigation of corn and soybeans at Conesville and Ankeny, Iowa, 1951 to 1955.** *Res. Bull. 458 Iowa Agric. Exp. Sta.*, 1958, pp. 245–59, illus.

Maize was grown for 2 yr. on soil of high water-holding capacity (Ankeny) and for 5 yr. on soil of low water-holding capacity (Conesville), with and without irrigation and with N applications ranging from 0–240 lb./ac. The average increase in yield brought about by irrigation at Conesville was 34 bu./ac. and at Ankeny 21 bu./ac. Maximum yields from irrigated maize were about 100 bu./ac., and from unirrigated maize, 39–95 bu./ac. The number of days with temperatures of 90°F. or above during May-August appeared to be closely related to the yields of both irrigated and unirrigated maize. Temperatures above 90°F. appeared to limit maize yields, irrespective of the supply of soil moisture. Despite abnormally wet weather at Ankeny in 1954, irrigation increased maize yields. Soyabeans grown at Conesville for 3 yr. showed increases of 40–50% in yield resulting from irrigation. Irrigation decreased the oil content of soyabeans by 4% and increased the protein content by 3·3%. F. s.—R.B.

625 Estación de Riegos de Córdoba. Spain. 2. Memoria-resumen de trabajos realizados 1953–1956. [**2. Summary report on work at the Côrdoba Station for Irrigation (Spain) during 1953-6.**] *An. Inst. nac. Invest. agron.* 1957, **6**, No. 4, 299–388.

Maize, pp. 347–53 and 381. In 1953 the highest yield of maize sown in spring-sown potatoes, resulted from 3244 cu.m. of water per ha. (444 cu. m. from 10 days' rainfall and 2800 cu.m. from 7 irrigations).—E.B.O.

626 Sasso, G. Prove sperimentali d'irrigazione del mais per aspersione e per infiltrazione. [**Experimental trials in irrigating maize by sprinkling and infiltration.**] *Atti Cent. naz. mecc. agric., Torino* 1956–7, **2**, 247–58, bibl. 3, illus., English, French and German summaries.

An account is given of trials carried out in 1956–7. [For the 1956 trial see *Fld Crop Abstr.* 11 : 516.] In 1957 the amounts of irrigation water given in each of the 3 applications were 150, 300, 450 or 600 cu. m./ha.; the maize varieties tested were Marano Vicentino, Wisconsin 355 (both early), Nostrano dell'Isola and Maygold 99A(both mid-season). The effect of irrigation on grain yields with regard both to amounts of water and to the irrigation system used were affected greatly by variety, climate and soil. In 1957 the 2 highest rates of water applied, 450 and 600 cu. m./ha., gave the following average additional increases in grain yields over the yields obtained from applying 300 cu. m.: Marano Vicentino 4% and 1%, Wisconsin 355, 19% and 7%, Nostrano dell'Isola 28% and 10%, Maygold 99A, 43% and 16%, respectively. With the lowest amount of water given by sprinkler irrigation, Wisconsin 355 yielded well, with 6258 kg./ha. Late-maturing maize hybrids, which are particularly susceptible to soil-moisture conditions, are considered suitable for use in irrigation trials.—E.B.O.

627 Mota, F. S. Influência da sêca sôbre o rendimento do milho em Pelotas. [**Influence of drought on maize yield at Pelotas (Brazil).**] *Bol. téc. 19 Inst. agron. Sul* 1957, pp. 26, bibl. 34, English summary.

Maize yields at Pelotas are determined by soil-moisture conditions during tasselling-silking. Total rainfall during that period is not considered the best expression of the influence of soil moisture on yield. The yield of maize sown at different dates, was, instead, correlated with the percentage of dry days during flowering. In an ecological trial in 1952 the correlation graph for these statistics, made separately for the varieties Charrua and Dietzche, was linear for the former and curvilinear for the latter. The correlation coefficients were highly significant. In 1953–4, when the variety Charrua only was used, the correlation coefficient did not vary much. The results given indicate a closer relationship of maize yield with percentage of dry days, than with rainfall. [See also *Fld Crop Abstr.* 9 : 1118.] F. s.—E.B.O.

628 El Hattab, H. S. **A comparison of yield and protein content in some local and imported double crosses in maize.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1957, **2**, No. 1, 131–5, bibl. 5. [Agronomy Fm, Fac. Agric., Univ. Cairo, Giza, Egypt] [Received Nov., 1958]

The local Giza hybrids and the imported Dixie 33 significantly outyielded the open-pollinated American Early. G.H. 93 and 53 yielded significantly more than Dixie 33. G.H. 90, 92 and 96 had the highest grain-protein contents. —A.M.H.

629 Departamento de Investigación Agropecuaria, Colombia. Investigación agricola en Tibaitatá. Sección de maíz. [**Agricultural investigation at Tibaitatá. Maize section.**] *Bol. misc. 1 Dep. Invest. agropec.* 1958, pp. 19–24, illus.

The characteristics are given of a new improved maize variety, Diacol V551.—E.B.O.

630 Nieto, J. and Staniforth, D. W. **Cornweed competition with varying soil fertility and moisture.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 41. [Iowa Agric. Exp. Sta., Ames]

In trials at 2 locations in Iowa during 1956 and '57, maize was grown on plots infested with *Setaria viridis* and *S. lutescens*. Maize plant populations of 8 to 24 thousand were used and N treatments were 0, 70 and 140 lb. N/ac. at one location and 0 and 70 lb./ac. at the other. At both locations, applying N offset to a large extent the yield losses caused by weeds, especially where maize plant populations were low. The maize yield losses per cwt. of weed yields increased as maize plant populations increased. At one location, combining N treatments with supplemental irrigation eliminated the competitive effects of weeds on grain yields of maize in some cases.—P.J.B.

631 Gantz, R. L. and Slife, F. W. **Soil incorporation of CDAA.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 42. [Univ. Illinois, Urbana]

Incorporating CDAA into the soil before sowing maize resulted in some reduction in its effectiveness against grass weeds, but had no significant effect on maize yields. In these trials rain fell a few days after applying the CDAA. There were indications that incorporating CDAA into the soil would enhance its effectiveness in years when no rain falls within a short time after application.—P.J.B.

632 Bertels, M. A. Pragas do milho, métodos de defesa. [**Pests of maize, control methods.**] *Bol. téc. 16 Inst. agron. Sul* 1956, pp. 18, bibl. 20, English summary. [Received Oct., 1958]

The possibility was investigated in Brazil of controlling pests of maize, a crop of low economic return, by chemical treatment. The principal pests of maize are listed. In most of the trials carried out for several years, significant results were obtained by spraying with deenate 50, a preparation based on DDT. The economic advantage of chemical treatment is discussed.—E.B.O.

633 Wellhausen, E. J. and others. Razas de maíz en la América Central. [**Races of maize in Central America.**] *Fol. tec. 31 Sec. Agric. Ganad., Méx.* 1958, pp. 138, bibl. 47, illus., English summary.

This monograph is concerned with the origin, characteristics and distribution of races of maize in Central America. Thirteen races and 9 sub-races were recognized in Guatemala, which is considered a centre of convergence and divergence for races of maize. A preliminary survey in El Salvador, Honduras, Costa Rica, Nicaragua and Panama indicated that there is less diversity of maize in all these countries combined than in Guatemala. [For races of maize in Mexico see *Fld Crop Abstr.* 6 : 918.] —E.B.O.

634 Kubo, A. **On the artificial pollen grain germination of *Zea mays* L.** *Bot. Mag. Tokyo* 1958, **71**, Nos. 841–2, 282–5, bibl. 20. [Fac. Sci., Hiroshima Univ.]

The results suggest that pollen grains of maize produced in the autumn are xerophilous and that those produced during summer are not. F. s.—D.B.

635 Glover, J. and Lampkin, M. **Responses to drought in maize and sorghum.** *Rep. E. Afr. agric., for. Res. Org. 1957*, Nairobi, [n.d.], pp. 16–17. [Received Sept., 1958]

In both spp. there was a close correlation between stomatal aperture and rate of carbon assimilation. Maize leaves quickly regained turgidity after severe wilting for 1 or 2 days and C assimilation continued normally, but there was a short delay between recovery of turgidity and resumption of normal stomatal behaviour, the length of the delay depending on the severity of wilting. After wilting for a week or more, the plants regained turgidity within a few hours of watering, but many stomata were killed or severely damaged and did not reopen, and CO_2 intake was severely curtailed. In young plants subjected to drought the leaves which had not yet unfolded were little affected. The effect of drought became more serious with the age of the plant. Sorghum stomata were more resistant to drought than those of maize and did not close completely even during droughts lasting a fortnight or more.—A.M.H.

636 Dumenil, L. C. **Relationship between the chemical composition of corn [maize] leaves and yield responses from nitrogen and phosphorus fertilizer.** *Diss. Abstr.* 1958, **19**, No. 4, 624. [Iowa State Coll., Ames]

637 Davidescu, D. Contributions au diagnostic foliaire de l'insuffisance de la nutrition phosphatique. [**Contributions to foliar diagnosis in the study of P-deficiency in plant nutrition.**] *2nd Internat. Symp. Phosphoric Nutr. Pl.* Isola d'Elba, Italy, Sept. 1958, pp. 2, bibl. 5. [Fac. Agric. Hort., Bucarest, Romania]

Maize is grown on more than 30% of the arable land in Romania. In the trial described, maize plants var. " Dent de cheval " I.C.A.R. 54 were grown in red-brown forest soil (pH 6·2) and/or sand as follows : (a) 100% sand ; (b) 75% sand, 25% soil; (c) 50% sand, 50% soil; (d) 100% soil. The plants were fed with a nutrient solution from which P was omitted. The symptoms of P-deficiency (described) were more evident in (a) and (b) than in (c) and (d), where there was a reserve of P. Besides soil type, the pH reaction of

the soil influences P-deficiency in plant nutrition.—E.B.O.

638 Nada, I. A. A. and Higazy, M. A. **The effect of seasonal changes on the sugar content of the successive leaves of *Zea mays* at full emergence.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 9–20, bibl. 17. [Fac. Agric., Cairo Univ., Giza] [Received Nov., 1958]

Maize, var. American Early, was grown under normal field conditions in 1953 and the fresh- and dry-weights and sugar contents of successive leaves were determined. The fresh weight of individual leaves of summer-sown plants increased rapidly from leaf 7 to a maximum at leaf 13 and then decreased steadily to leaf 21. In plants sown during the flood season the pattern was similar, but there was little change in fresh weight between leaves 14 and 19. The summer sowing gave slightly higher leaf weights. Dry weight per leaf was at a maximum at leaf 13 in summer-sown plants and at leaf 17 in flood-sown plants. The middle fully-expanded leaves contained the highest amounts of reducing sugars and sucrose. Leaves of summer-sown plants generally contained more sucrose than reducing sugars. In flood-sown plants, leaves 7–17 contained less sucrose than reducing sugars, while the reverse was true for subsequent leaves. The total sugar content of the fully-emerged leaves from summer-sown plants was more than twice that from the corresponding leaves from flood-sown ones.—A.M.H.

639 Nada, I. A. A. and Higazy, M. A. **The effect of age on the sugar metabolism of the successive leaves of *Zea mays* during the summer and flood plantings.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 117–28, bibl. 9. [Fac. Agric., Cairo Univ., Giza] [Received Nov., 1958]

[See previous Abs.] The sugar content of leaves of American Early maize was measured at full emergence and at various stages of senescence.—A.M.H.

640 Nada, I. A. A. and Higazy, M. A. **The effect of age on the carbohydrate metabolism of the successive internodes of *Zea mays*.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 2, 5–15, bibl. 14. [Fac. Agric., Ain Shams Univ. and Fac. Agric., Cairo, Univ. Giza] [Received Nov., 1958] [See Abs. 638 and 639]

641 Nada, I. A. A. and Higazy, M. A. **The average constituents of the successive internodes of *Zea mays* during the summer and flood plantings.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo*, 1957, **2**, No. 1, 173–87, bibl. 8. [Fac. Agric., Ain Shams Univ. and Fac. Agric., Cairo Univ., Giza] [Received Nov., 1958]

The fresh- and dry-weight, and content of reducing sugars, sucrose, total sugars, fermentable, non-fermentable and total polysaccharides were determined for successive internodes of American Early maize from both summer and flood sowings. [See also Abs. 638–40.]—A.M.H.

642† Nielsen, K. F. **The influence of alfalfa green manure on the availability of phosphorus to plants.** *Diss. Abstr.* 1958, **18**, No. 4, 1198–1200. [Ohio State Univ., Columbus]

Lucerne green manure and KH_2PO_4 were compared as P carriers in greenhouse experiments on maize and *Sorghum sudanense*, using radioactive tracer techniques. Maize grown in green-manured soil absorbed more P than maize grown in inorganically-manured soil. Where green manure was applied, residual P was released from the soil in proportion to the quantity present.—R.B.

643 Corby, H. D. L. **Grasslands Research Station, Marandellas. Work with other crops [maize].** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1957*, Salisbury, 1958, 50.

With amounts of N up to 100 lb./ac., a single dressing applied at 5 weeks after sowing gave maize grain yields as high as where the equivalent amount of N was applied in 2 dressings, at sowing and 10 weeks later. Sowing on 16 Nov. increased yield by 2·4 bags/ac. [1 bag = 200 lb.] compared with sowing on 6 Dec. Maize which was kept practically free from weeds yielded 16·4 bags/ac., that hand-hoed 6 weeks after sowing yielded 11·3 bags and that not hoed at all, 4·1 bags.—A.M.H.

644 Barber, S. A. **Relation of fertilizer placement to nutrient uptake and crop yield. 1. Interaction of row phosphorus and the soil level of phosphorus.** *Agron. J.* 1958, **50**, No. 9, 535–9, bibl. 4. [Purdue Univ. Agric. Exp. Sta., Lafayette, Indiana]

Maize was unable to obtain sufficient P from row applications to produce maximum yields. Wheat and soyabeans gave maximum yields with either broadcast or row applications. F.s.—R.B.

645 Robertson, W. K. and others. **Response of corn in superphosphate placement experiment.** *Proc. Soil Sci. Soc. Amer.* 1958, **22**, No. 5, 431–4, bibl. 10. [Florida Agric. Exp. Sta., Gainesville]

Experiments were carried out in 1956 and 1957 with maize grown on 2 soils fertilized with 30 lb. P_2O_5/ac. placed 2, 8, 14 and 20 in. deep. In the dry year 1956, deeper P applications gave significantly greater yields than did shallower applications, except on one soil where compaction at a depth of 8 in. caused reduced yields ; where no residual P was present in this soil, P at 2 in.

gave the best yields. In the wet year 1957, depth of P application did not affect yields when soils contained residual P ; on one soil, increase in depth of P application significantly reduced the percentage of P in the plants ; subsoil tillage without added P increased maize yields from 37 to 55 bu./ac., approximately equal to the yields of plots receiving P.—R.B.

646 Department of Scientific and Industrial Research, Great Britain. **Underground storage of grain.** *Pest Infest. Res., Rep. Pest Infest. Bd 1957*, 1958, 14–15.

After pit storage [in England] for 2·5 yr., most of a 63-ton bulk of maize was apparently sound and had a moisture content of 12·5–14·5%. Viability of the maize was very low, 13 samples having germination percentages of nil and 2 of 4–5%.—A.M.H.

647 Joffe, A. **Moisture migration in horizontally-stored bulk maize : the influence of grain-infesting insects under South African conditions.** *S. Afr. J. agric. Sci.* 1958, **1**, No. 2, 175–93, bibl. 13, French and Afrikaans summaries. [Agric. Res. Inst., Pretoria]

The problem of surface spoilage of bulk-stored grain, caused by accumulation of water in the surface layers as a result of convection currents set up by large temperature gradients, is discussed. Experiments were conducted to test the hypothesis that surface accumulation of moisture would not occur in the absence of metabolically-active grain insects. At 4 sites, untreated bulks of maize, with heavy insect infestations, were 10–30°F. warmer than those fumigated with methyl bromide and surface-sprayed with BHC/DDT preparations. The presence of an established insect infestation also resulted in mouldiness, caking, rotting and some sprouting of the surface layers of maize, while the fumigated bulks showed no similar signs of moisture redistribution after 1–2 years' storage. F. s.—A.M.H.

648 Hall, C. W. and Rodriguez-Arias, J. H. **Equilibrium moisture content of shelled corn.** *Agric. Engng, St. Joseph, Mich.* 1958, **39**, No. 8, 466–70, bibl. 14. [Michigan Agric. Exp. Sta., East Lansing]

The equilibrium moisture content of maize grain was determined at 6 temperatures, ranging from 40 to 140°F., and relative humidities of 10–85%. Values for 0–10 and 85–100% R.H. were obtained by extrapolation. The data are discussed in terms of published adsorption theories and equations.—A.M.H.

649† Cabell, C. A. and others. **Some effects of variation in drying temperature, heating time, air flow rate, and moisture content on nutritive value of field shelled corn.** *J. Anim. Sci.* 1958, **17**, No. 4, 1204. [Abstract] [Agric. Res. Serv., U.S. Dep. Agric.]

Samples of maize were dried by means of either heated or unheated air, and the nutritive value of the protein was determined. Maize containing 25% moisture dried for 4 hr. in air heated to 198°F., at an air-flow rate of 80·5 cfm./bu., showed no loss in protein nutritive value. Maize containing 29–32% moisture dried in air at 240°F. and 110–112 cfm./bu. for 1·5 hr. or less was undamaged during drying, but under similar conditions, air at 280°F. caused discoloration and loss in protein nutritive value. Maize containing 28% moisture, dried with unheated air at 0·85 cfm./bu., developed mould and acidity and the nutritive value of the protein was reduced ; at lower moisture-content or increased air-flow rate, no damage occurred. None of the treatments caused significant losses of carotene. F. abstr.—R.B.

650 Graham, W. M. and Kockum, S. **Protection of bagged maize with lindane and DDT.** *Trop. Agric., Trin.* 1958, **35**, No. 4, 292–8, illus. [Scott Agric. Lab., Kenya]

Dusting bags of maize in stacks with 0·5% lindane at 3 oz./bag gave significantly more effective protection from *Tribolium castaneum* than did spraying with 50% wettable DDT (1 lb./gal.; 3 gal./1000 sq.ft.). Results indicated that the insect population was just becoming re-established 13 months after treatment. DDT was better than BHC for controlling *Oryzaephilus surinamensis*. Where populations of *T. castaneum* were small, the temperature of the stack remained low and consequently unfavourable to *O. surinamensis*. Control of *T. castaneum*, therefore, resulted in indirect, partial control of the latter sp.—A.M.H.

651 Department of Agriculture, New South Wales. **Stored product pests. Wheat weevils (*Calandra oryzae* and *Rhizopertha dominica*).** *Rep. Dep. Agric. N.S.W. 1957*, Sydney, 1958, p. 70.

Fumigation of oats in 2000-bu. galvanized iron silos with 3 pt. CS_2/1000 cu. ft., with a residual spray of DDT on the outsides of the silos, gave satisfactory control of primary and secondary grain beetles. A heavy infestation of bagged maize was controlled by fumigating with 1·5 lb. methyl bromide/1000 cu. ft. plus residual spraying with 2% methoxychlor wettable powder. Maize in 5-gal. drums was protected for 3–4 months with malathion dust and for 6 months with BHC dust [rates not given].—A.M.H.

652 Davies, J. C. **Aluminium phosphide for bulk grain fumigation in Uganda.** *E. Afr. agric. J.* 1958, **24**, No. 2, 103–5, bibl. 1. [Kawanda Res. Sta., Dep. Agric., Uganda]

Heavily-infested maize grain in large steel bins was fumigated with phosphine liberated by the action of moisture on tablets of aluminium phosphide and ammonium carbamate. A rate of 10·2 tablets (each weighing *c.* 3g.) per ton gave a satisfactory kill of the range of grain insects present.—A.M.H.

653 Caswell, G. H. and Clifford, H. T. **The effect of ethylene dichloride and carbon tetrachloride on the germination and early growth of maize.** *Emp. J. exp. Agric.* 1958, **26**, No. 104, 365–72, bibl. 5. [Univ. Coll., Ibadan, Nigeria]

The susceptibility of the grain of 5 maize varieties to a fumigant consisting of equal parts by volume of ethylene dichloride and carbon tetrachloride was tested. The fumigant was used at 10, 20 or 40 c.c./cu.ft. of storage space. Only the varieties 3795 Trinidad and Mexico 1 showed any significant decrease in % germination after fumigation, but seedling growth of all varieties was retarded. The effect was roughly proportional to the concentration of fumigant used and, in Mexico 1, it increased with increasing storage temperature and duration of contact with the fumigant. The triple hybrid (Cuba Amarillo × Mexico 16) × (Sicaragua × Mexico 16) was the variety least affected.—A.M.H.

654 Division of Economics and Markets, Department of Agriculture, Union of South Africa. **Method of calculation of maize production cost.** *Bull. 359 (Econ. Series 47) Dep. Agric. S. Afr.* 1958, pp. 51, 3 maps.

SWEET-CORN

655 Gagnon, L. P. Notes sur la répression des mauvaises herbes dans le maïs sucré. [**Notes on weed control in sweet-corn.**] *Rep. Quebec Soc. Protect. Pl. 1957*, 1958, 79–81. [Div. Mauvaises Herbes, Minist. Agric., Québec]

The sweet-corn varieties Sparcross and Lee were treated with (a) dinoseb at 3·6 lb./ac. before emergence, or (b) dinoseb at 2 lb./ac. when the plants had 2 leaves, or (c) 2,4-D at 0·5 lb./ac. when the plants were 6 in. tall. Treatments (a) and (b) gave almost complete control of *Chenopodium* spp., 85% control of *Polygonum persicaria* and 80% control of *P. convolvulus*. *Setaria* spp. were controlled best by (a). Treatment (c) gave very poor results. Maize yields were increased by 25% and maturation was hastened by 8 days, as a result of treatments (a) and (b).—R.B.

656 Nonnecke, I. L. **Yield variability of sweet corn and canning peas as affected by plot size and shape.** *Diss. Abstr.* 1958, **19**, No. 4, 627. [Oregon State Coll., Corvallis]

Optimum plot size for sweet-corn was one or two basic units of 10ft. × 6ft., or 20ft. × 3ft., and for canning peas, one basic unit of 5ft. × 10ft. —P.J.B.

SORGHUM

See also Abs. 937, 966, 976

657 Brooke, C. **The durra complex in the Central Highlands of Ethiopia.** *Econ. Bot.* 1958, **12**, No. 2, 192–204, illus., maps 1, bibl. in text. [Div. Social Sci., Portland State Coll., Portland, Oregon]

Durra (*Sorghum vulgare*), the dominant field crop in the Central Highlands of Ethiopia, is sown during April in areas above 5800 ft. and during May in lower areas. A rapidly-maturing variety is frequently sown in some areas in June or July. The seed is broadcast and on fertile soils the plants are thinned to a spacing of 1·5 × 2 ft. The grain is harvested in December or January. Maize, beans (*Phaseolus* spp.), gourds (*Lagenaria vulgaris*), melons (*Cucumis melo*), peppers (*Capsicum* spp.), fenugreek (*Trigonella foenum-graecum*) or groundnuts may be sown in the same fields with durra. The general practice is to sow durra in the same field year after year until yields fall ; the application of compost helps to prolong this period. Other crops are then sown for a period, before allowing the fields to lie fallow for 2–3 yr., after which one crop of peas or other legume is taken, and durra is again sown continuously. Maize does not grow well in areas above 7000 ft. Above 7500 ft. barley (grown alone) is an important crop ; 2-rowed barley (*Hordeum distichon*) is grown throughout the area, and 6-rowed barley (*H. vulgare*) is grown in the eastern part of the Highlands. At lower altitudes barley is grown as an emergency crop when durra fails. Groundnuts and sesame (*Sesamum indicum*) are grown as cash crops.—R.B.

658 Venkatrao, S. and others. **Effect of insect infestation on stored grain. 3. Studies on kaffir corn (*Sorghum vulgare*).** *J. Sci. Fd Agric.* 1958, **9**, No. 12, 837–9, bibl. 11. [Cent. Fd Technol. Res. Inst., Mysore, India]

[See also *Fld Crop Abstr.* 11 : 158.] Kaffir corn was subjected to infestation by *Calandra oryzae* weevils and the changes brought about in the grain were studied. Loss in weight of grain and the extent of contamination with insect fragments and excreta were assessed. The uric-acid content of the grain increased with increasing infestation. An increase in kernel damage and fat acidity and a decrease in thiamine content were also observed. F. s.—A.M.H.

RICE

See also Abs. 937, 978, 1072, 1084, 1085

659 Krochmal, A. **Rice production in Afghanistan.** *Econ. Bot.* 1958, **12**, No. 2, 186–91, bibl. 2, illus., maps 2.

Maps and tables are given of the total rice production in the provinces of Afghanistan and of the localities in which the 13 recognized varieties are grown. Rice is the third most important crop after wheat and maize and is usually grown in rotation with either winter wheat or clover. The average yield is 1200–1600 lb./ac.—R.B.

660 Lévêque, L. A. Notes sur la riziculture en Afghanistan. [**Notes on rice-growing in Afghanistan.**] *Riz et Rizicult.* 1958, **4**, No. 2–3, 105–12, illus., English and Spanish summaries.

661 Patrucco, G. Risicoltura in Colombia. [**Rice-growing in Colombia.**] *Riso* 1958, **7**, No. 8, 12–14.

662 Bernardes, B. C. Irrigação. [**Rice irrigation.**] *Lavour. arroz.* 1958, **12**, No. 140, 289–90. [Esta. Exp. Arroz, Gravataí, Rio Grande do Sul, Brazil]

In Rio Grande do Sul, it is recommended that irrigation of rice should start soon after emergence, but not later than 15 days after. After 20–30 days the fields should be drained until the plants show signs of wilting ; during this period their roots grow deep into the soil in search of water. Irrigation is then resumed ; it is stopped when the rice grain is in the dough stage. As a general rule, water which contains more than 1·2 g. of NaCl per l. should not be used for irrigating rice. Varieties with a strong and thick stem, such as Blue-Rose, Prolific, Agulha and Fortuna, are more salt-resistant than the Japanese varieties, which have a thin stem.—E.B.O.

663 Director of Agriculture, British Guiana. **Experiment on the Japanese method of rice cultivation.** *Rep. Dir. Agric. Brit. Guiana 1956*, British Guiana, [n.d.], p. 31. [Received August, 1958]

Seedlings from local-type flooded nursery beds again gave better yields than those from raised and fertilized Japanese-type nursery beds.—A.M.H.

664 Hodges, R. J., Jr. **Rice, a big business on the Gulf Coast Prairie.** *Bull. B-872 Texas Agric. Ext. Serv.* [n.d.], pp. 15, bibl. 11, illus.

Cultural practices, weed-, pest- and disease-control and rice varieties recommended for the coastal areas of Texas are described.—R.B.

665 Riso. Confusione di danni da trapianto e da diserbo. [**Confusion regarding the damage caused to rice by transplanting and chemical weeding.**] *Riso* 1958, **7**, No. 10, 25–7, illus.

In Italy during 1958 rice was often transplanted late (end June/beginning July) because of labour scarcity. Late transplanting causes low yields and abnormal development, the latter often being attributed to chemical weeding. The abnormalities caused by transplanting late, and those caused by too high a dose of herbicide often appear similar from a superficial, but not from a close, examination. Both types of abnormalities are described. In the case of slight damage, however, a diagnosis may be difficult.—E.B.O.

666 Kai-Chü, Y. **A study of regeneration rice.** [Chinese] *Acta Agric. sinica* 1958, **9**, No. 2, 107–33, bibl. 21, illus., English summary. [Szechuan Agric. Coll.]

Experiments were made on ratooning of rice, using the medium-early variety Shui Pe Tiao. Since the yield of the ratoon crop was only 21% that of the first crop, it is recommended that quick-maturing varieties of early to medium type should be grown for ratooning. Harvesting date and height of stubble of the first crop and the role of fertilizers were investigated for their effect on yield of the ratoon crop. F. Eng. s.—D.B.

667 Buffa, G. and Corbetta, G. Varietà di riso più diffuse in coltura e nuove razze. [**The principal rice varieties grown (in Italy) and new varieties.**] *Quad. 5 Ente naz. Sementi elette* 1958, pp. 36, bibl. in text, illus. [Milano, Italy]

The varieties described were grown on more than 99% of the Italian rice area (about 140,000 ha.). They include 19 old varieties, 4 introduced into cultivation over the last 5 years (Balilla Large Grain, Early Corbetta, Lomello and Roverbella), and 7 new varieties released to farmers in 1957 (Ferraris, S. Giacomo, S. Domenico, Balocco, Baraggia, Olcenengo and Colosso).—E.B.O.

668 Negi, L. S. and Saini, S. S. **Chinese varieties have future in Punjab hills.** *Rice News Tell.* 1957, **5**, No. 1, 5–9, bibl. 3, illus.

At the Rice Breeding Sub-station, Nagrota Bagwan, Punjab, 3 Chinese rice varieties Ch. 45, Ch. 47, and Ch. 988 were tested against Lal Nakanda 41, which is the approved variety for rain-fed areas in the Kangra Hills and has the same growth period and coarse quality as the Chinese varieties. Two cultivation methods were used : (1) transplanting and (2) dry broadcast-sowing. Under both methods, the Chinese varieties gave significantly higher yields than Lal Nakanda 41, Ch. 45 giving the highest yields by transplanting and Ch. 988 by dry broadcast-sowing. Judging by combined results from both cultivation methods, the best of the Chinese varieties was Ch. 988, and it maintained its superiority in farm trials. It was also the earliest-maturing variety (about 14 days earlier than Lal Nakanda 41). Observations on morphological features of the 4 varieties are tabulated. The Chinese varieties had better cooking qualities than Lal Nakanda 41. At the Cereal Breeding Sub-station, Kulu, (4000–5000 ft. a.s.l.), Chinese varieties gave significantly higher yields compared with Dundar 43. Ch. 972 and Ch. 47 gave the

highest yields. In the Kulu valley, the Chinese varieties matured 8–10 days earlier than Dundar 43. Chinese varieties tended to lodge and to shed their grains when fully ripe.—D.B.

669 KJAER, A. **Seed purification, increase and certification.** *Publ. FAO/58/5/3888* 1958, pp. 5.

This paper, prepared in connexion with a Rice Specialization Course held at Vercelli, Italy, in May, 1958, is concerned mainly with rice seed. —E.B.O.

670 TALLON, G. La flore des rizières de la région d'Arles et ses répercussions sur la culture du riz. [**The flora of the rice fields in the region of Arles and its repercussions on the growing of rice.**] *Vegetatio, Haag* 1958, **8**, No. 1, 20–42, bibl. 7, table. [Réserve zool. bot. Camargue, France]

Rice is a recently introduced crop in France ; its success is threatened by the ever-increasing infestation of weeds. A 3-yr. study of these weeds was made in the region of Arles in 122 surveys. The weeds form the association Typheto-Scirpetum; some of the spp. composing it are new and have probably been introduced in foreign, mainly Italian, seed. In addition to *Typha, Scirpus, Cyperus* and *Alisma* spp., *Polygonum persicaria* and *Phragmites communis* (not very abundant), attention is drawn to the grass sp. *Echinochloa crus-galli* and its variety *hostii*, both dangerous weeds in rice. *Chara* spp., rapidly-growing aquatic cryptogams, form a soil-covering mat which has a smothering effect. The grouping of the spp. within the association, the origin and propagation of the different plants, and the general causes of their dissemination in rice cultures are discussed. Observations made on the individual spp. throw light upon the conditions encouraging or inhibiting their growth. Measures for the prevention of weed growth include better seed-cleaning. The use of selective herbicides is still largely experimental, but at least one successful experiment in the control of *Typha angustifolia* and *T. latifolia* by this means is reported. *Chara* spp. can be controlled by copper sulphate. The possible use of cultural measures such as rotation, including a dry crop between two rice crops, cultivated fallow, and the transplanting of rice (successfully tried in the Arles region in 1950) are also discussed.—G.M.R.

671† WEST AFRICAN RICE RESEARCH STATION. **Arboricide and herbicide trials.** *Rep. W. Afr. Rice Res. Sta., Rokupr, Sierra Leone, 1957*, London : Crown Agents for Overseas Governments and Administrations, 1958, 10–14.

When applied as a basal trunk spray, 2–4% 2,4-D was more effective for control of *Avicennia nitida* than 2,4,5-T. With frilling, lower concentrations of 2,4-D were effective. Trees partially affected one year after treatment with water-based sprays of 2,4,5-T and ATA recovered in the second year after treatment. For *Rhizophora racemosa*, 0·5–4% 2,4-D gave a higher rate of kill than 2,4,5-T, especially where frilling was carried out. Dalapon at 5–20 lb. in 50 gal. water/ac. gave good control of *Paspalum vaginatum*. The lower rates were not effective when the grass was cut close to the ground a week before spraying. All the rates used gave best results when the grass was burnt 2 weeks before spraying.—A.M.H.

672 CHAVAN, V. M. and others. **Controlling wild rice menace with purple-leaf varieties [of cultivated rice] in Bombay-Karnatak.** *Rice News Tell.* 1958, **6**, No. 3, 15–16.

673 WALKER, H. G. **The importance of diseases, insects, weeds and other pests attacking rice in the field.** *Publ. FAO/58/6/4577* pp. 8.

A brief summary is given of results obtained from a survey of diseases, pests and weeds of rice, and their control, in the rice-growing countries visited.—E.B.O.

674 FERNANDO, H. E. and MANICKAVASAGAR, P. **Investigations on the control of the paddy stem fly *Atherigona* sp. (Fam. Anthomyiidae Ord. Diptera.).** *Trop. Agriculturist* 1957, **113**, No. 4, 341–5, bibl. 3.

Tests have shown that ekatin, parathion, gusathion, and dipterex, in this descending order of effectiveness and in small doses, control the maggots of *Atherigona* spp. in rice stems. F. s.—D.B.

675 ABRAHAM, E. V. **The rice leaf-roller (*Cnaphalocrocis medinalis* Gr.) and its control.** *Madras agric. J.* 1958, **45**, No. 7, 273–5. [Agric. Res. Sta., Aduthurae]

Spraying with parathion (0·025%), endrin (0·02%) or BHC (0.05%) controlled *C. medinalis* on rice.—D.B.

676 PATIL, S. S. **Crab control in paddy fields.** *Farmer, Bombay* 1958, **9**, No. 10, 19–21. [Agric. Res. Sta., Vadgaon (Maval), Poona District]

A method for controlling crabs in rice fields by using endrine pelleted with cooked rice is described. The total cost in time and materials worked out at Rs. 3 per ac.—D.B.

677 AGRICULTURAL RESEARCH STATION, SURINAM. Hoja blanca, een ernstige bedreiging voor onze rijstcultuur. [**White leaf, a grave threat to rice-growing in Surinam.**] *Surinaam. Landb.* 1958, **6**, No. 1, 30–2, bibl. 8.

The history of this virus disease from 1954 onwards is traced. It has not yet invaded Surinam, but is much to be feared because the long-grain rice varieties grown in Surinam are especially susceptible to it. It is probably insect-borne. Rice

varieties from Surinam have been sent to Venezuela where their resistance to white leaf will be studied. The possibility of crossing Surinam material with, e.g., the resistant American variety Lacrosse with its short to semi-long grain, is mooted.—G.M.R.

678 Adair, C. R. and others. **Summary of research on hoja blanca.** *Rice J.* 1958, **61**, No. 8, 15–17, 39, 40, bibl. 8, illus.

Rice varieties resistant and susceptible to *hoja blanca* are given. Several spp. of leafhoppers suspected as being vectors of the disease are named. [See *Fld Crop Abstr.* 11 : 1503.]—R.B.

679 Malaguti, G. and Angeles, N. Ensayos preliminares sobre el uso de insecticidas en el control de los vectores de la " hoja blanca" del arroz. [**Preliminary trials on the use of insecticides for controlling the insect vectors of " white leaf " in rice.**] *Agron. trop., Maracay* 1957, **7**, No. 3, 161–3, bibl. 2, English summary. [Cent. Invest. Agron., Maracay, Venezuela]

In 2 trials, treatment with some systemic insecticides, in particular metaisosystox and metasystox, reduced the percentage of rice plants affected by " white leaf " (a virus disease transmitted by leafhoppers), reduced the populations of leafhoppers, and increased crop yields.—E.B.O.

680 Sampath, S. and Govindaswami, S. **Wild rices of Orissa ; their relationship to cultivated varieties.** *Rice News Tell.* 1958, **6**, No. 3, 17–20, bibl. 8, illus. [Central Rice Res. Inst., Cuttack, India]

The morphological features of *Oryza perennis* var. *balunga* and *O. sativa* var. *fatua* from various sources are described.—D.B.

681 Butany, W. T. **Variation in the stamen number in *Oryza brachyantha* A. Cheval. *et* Roehr. and the frequency of occurrence of 3-styled gynaecea in *O. grandiglumis* Prodoehl.** *Curr. Sci.* 1958, **27**, No. 9, 354–5, bibl. 5, illus. [Central Rice Res. Inst., Cuttack, India]

In *O. brachyantha* instances are reported of a variation in the number of stamens per spikelet in the same panicle. The number varies between 2 and 6 but is mostly 4 or 5, instead of the normal 6. In *O. grandiglumis* 65% of nearly 1000 spikelets examined had 3-styled pistils.—D.B.

682 Misra, G. and Mishra, D. **Effect of presoaking seed treatment with 2-methylbenzimidazole on rice seedlings.** *Curr. Sci.* 1958, **27**, No. 9, 356, bibl. 7. [Ravenshaw Coll., Cuttack 3, India]

Seeds of an early-maturing rice variety, N 136, were soaked for 48 hr. in a solution of 2-methylbenzimidazole at concentrations of 1, 10, 100 and 1000 ppm., and then allowed to germinate. Compared with soaking in distilled water, 2-methylbenzimidazole at concentrations of 1 and 10 ppm. significantly increased the length of root and shoot and the fresh weight of the plant ; concentrations of 100 and 1000 ppm. had a significantly inhibitory effect on growth, especially of the root.—D.B.

683 Sasaki, N. and Fukuju, H. **Physico-ecological studies on early cultivation of paddy rice plant. 1. Carbohydrate and nitrogen content of the rice seedlings as influenced by low soil-temperatures after transplanting and their relationships with the rooting abilities.** [Japanese] *Bull. Fac. Agric., Hirosaki Univ.* 1958, No. 4, 19–28, bibl. 5, English summary.

After transplanting, root growth and development of the rice seedling depended on temperature, especially of the soil. 15°C. [soil] was too low for root development. Provided that temperature was adequate [temperature not stated], rooting ability increased with the amount of carbohydrates in the tops. Under low soil-temperatures, seedlings became severely deficient in N and top growth was slow, also there was a high concentration of sugars in the roots. F. Eng. s.—D.B.

684 Rajagopalan, K. **Root development improves drought resistance.** *Rice News Tell.* 1957, **5**, No. 1, 10–12, illus. [Agric. Res. Inst., Coimbatore, Madras State, India]

In pot and field experiments, the root systems of an upland rice (MTU. 17) representing a drought-resistant type and of a lowland rice (Co. 13) representing a drought-susceptible type were compared. Roots of 45-day-old seedlings of the upland variety, grown in pots, at 40% moisture level, were longer, had a greater spread and greater dry weight than roots of the lowland variety grown under similar conditions. Among 50-day-old seedlings grown in the field, the upland variety had thicker roots which grew first obliquely, later vertically, downwards and penetrated to a depth of 50–55 cm. In the lowland variety, roots were thin and fibrous ; they penetrated to 39 cm., and lateral roots occupied the surface soil to a depth of 15 cm. The root/shoot ratio and the mean length and dry weight of the root system were greater in the upland than in lowland rice. Examination of pot- and field-plants at flowering showed that tillers survived longer in upland than in lowland rice.—D.B.

685 Yamada, N. and Ōta, Y. **Study on the respiration of crop plants. Enzymatic oxidation of ferrous iron by root of rice plant.** *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 3, 205–11, bibl. 3, Japanese summary. [Nat. Inst. Agric. Sci.]

An extract obtained from rice roots oxidized ferrous iron to ferric iron. Reasons are given which show that this is an enzymatic action, the enzyme

being closely related to peroxidase. This activity explains the deposition of ferric compounds on the surface of roots growing in paddy fields and may account for resistance to root rot.—D.B.

686 Ueda, H. and Oyama, K. **Studies on respiratory mechanism of roots in rice plants growing on submerged paddy fields. The influence of water-percolation on growth of rice plants.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 4, 249-51, bibl. 3, illus., English summary. [Tottori Univ.]

Periodical soil drainage was better than continuous drainage for growth of leaves and stems. Drainage caused a decrease in yield owing to loss of nutrients. Periodical circulation of irrigation water increased yields by about 8% above control. This was accompanied by vigorous root growth which was a response to increased supplies of O_2 and the removal of injurious gases. F. Eng. s.—D.B.

687 Wu, H. Y. and Tang, P. S. **Studies on plant respiration. 2. Adaptive formation of nitrate reductase in rice seedlings.** [Chinese] *Acta bot. sinica* 1958, **7**, No. 3, 135–48, bibl. 22, English summary.

The results of these experiments appear to furnish a convincing demonstration of the adaptive formation of nitrate reductase in rice seedlings (var. Yin-fang). This is perhaps the first clear instance in support of the formation of an adaptive enzyme in higher plants. The significance of this finding in relation to mineral nutrition of rice plants and in the general theme of the mechanism of adaptation of plants to their environment is discussed. F. Eng. s.—D.B.

688 I-Shun, T. **The influence of detillering treatment on aerial branching and branching from the rachis of rice and wheat.** [Chinese] *Acta bot. sinica* 1958, **7**, No. 2, 123–34, bibl. 25, illus., English summary. [Fuh Tan Univ.]

Detillering induced aerial branching in *Oryza sativa* and *Hordeum distichon* and it increased the number of florets per spikelet in *Triticum monococcum* and *T. dicoccum*. Compared with control plants, detillered plants were shorter and more robust ; their development was accelerated and they produced more seed, especially the wheat species. F. Eng. s.—D.B.

689 Tang, S. H. and Liu, J. S. **Development of rice panicle under different conditions.** *Scientia sinica* 1958, **7**, No. 9, 979–89, bibl. 18, illus. [Inst. Plant Physiol., Academia Sinica]

The developmental morphology of the rice panicle, from the beginning of differentiation of the shoot apex to the flowering stage, was studied by dissection, in an early, a medium, and a late variety of *Oryza sativa*. The plants were grown under short-day (10 hr.) and natural photoperiod—for each photoperiod the seeds having been either vernalized [*sic*] (30°C. for 10 days), or non-vernalized but soaked [in water] at 25°C. for 36 hr. With the early variety, photoperiodic response was negligible compared with the vernalization effect which accelerated both differentiation of panicle primordia and ear emergence to a greater extent than in the medium- or late-varieties. In the medium variety, the effect of vernalization was negligible compared with that of photoperiod ; whether vernalized or not, short day markedly accelerated differentiation and ear emergence. With the late variety, whether vernalized or not, there was a significant acceleration (greater than in the medium variety) in panicle differentiation and ear emergence. The application of these results to the local conditions of Shanghai is very briefly discussed.—D.B.

690 Wen-Kwei, P. and Yü-Ruey, Y. **Fertilizers in relation to the growth and development of crop plants. 6. Partial sterility induced by internal nutrient competition in rice plants.** [Chinese] *Acta Agric. sinica* 1958, **9**, No. 2, 166–76, bibl. 7, English summary. [Acad. Agric. Sci. China, Peking]

691 Morita, N. and Taya, N. **Dynamical studies on the straw of paddy-rice with reference to lodging. 1. The dynamical characteristics of straw of paddy-rice with various amounts of nitrogen fertilizer and barnyard manure, and the relation between these characteristics and lodging. 2. Periodic difference of the dynamical characteristics, deflection of fresh straw at the ripening stage and the relative relation between these characteristics and lodging.** [Japanese] *Bull. Fac. Agric., Hirosaki Univ.* 1957, No. 3, 52–66, bibl. 6, English summaries.

692 Leonzio, M. I microelementi nel riso e la loro importanza biologica. [**Microelements in rice and their biological importance.**] *Riso* 1958, **7**, No. 8, 8–11.

Information, derived from Italian and other sources, is given on the amounts of microelements present in the grain and other parts of the rice plant.—E.B.O.

693 Yamaguchi, H. and others. **Researches on technical improvement of rice culture on ill-drained fields. V. Studies on the physiological characteristics of rice varieties as related to the resistance against yield-fall. 5. Varietal differences in H_2S-oxydation activity of rice roots.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 3, 193–4, English summary. [Chiba Agric. Exp. Sta.]

The results indicate that oxidation of H_2S is carried out by root cells as well as by Fe^{+++} ions

on the surface of the roots. When seedlings were grown under a high temperature, the later-maturing varieties had a greater ability to oxidize H_2S than the earlier varieties. When grown at low temperatures, no varietal difference in oxidizing ability was observed. Resistance to yield-fall (Akiochi) was related to H_2S oxidation by roots. F. Eng. s.—D.B.

694 McDonald, D. J. **A rapid method for determining suncracking in rice.** *J. Aust. Inst. agric. Sci.* 1958, **24**, No. 4, 351–3, bibl. 5, illus. [Yanco Exp. Fm, Dep. Agric., N.S.W.]

The apparatus used consists of a plane silver-backed glass mirror upon which a beam of light is directed at an angle of 10–15°. Dehulled grains are placed on the mirror surface and examined from above and to one side, so that the grains and their mirror images are visible. Light shining from the reflecting plane of the mirror upon the under-surface of the grain gives the maximum contrast between the endosperm portions on either side of the fracture, thus enabling sun-cracked grains to be detected.—A.M.H.

695 ten Have, H. Bemestingsproeven met rijst in de Prins Bernhardpolder. **Fertilizer trials with rice in the Prince Bernhardpolder [Surinam].** *Surinaam. Landb.* 1958, **6**, No. 1, 3–17, bibl. 32, English summary.

The soil concerned is heavy coastal clay, slightly acid, with a reasonable amount of organic matter, high K and moderate P content. It was found that ammonium nitrogen is best suited for rice. Broadcasting sulphate of ammonia on water was less effective than broadcasting it on a drained field. Top-dressing sulphate of ammonia was far more effective than a basic application. From field trials it was found that : the application of up to 30 kg. N per ha. is best done when the rice is about 8 weeks old ; that larger quantities give the best results with a split application about 7 and 10 weeks after sowing ; and that when large amounts of N are applied late a very heavy and excessively leafy crop results, with enhanced tendency to lodge. Varietal differences in response to heavy applications of N were determined, varieties which respond well having a smaller leaf area and less vigorous growth habit. Varieties best suited to mechanized farming showed the best response to nitrogen fertilizers. No increases in yield resulted from applications of P, K or Ca. Experiments in the use of *Crotalaria quinquefolia* as a green manure are in progress and promise well. F. Eng. s.—G.M.R.

696 Labrousse, G. L'utilisation actuelle des roues-cages en riziculture camarguaise et les autres solutions. [**The present use of " cage-wheels " in rice-growing in Camargue (France) and other solutions.**] *Riz et Riziculture.* 1958, **4**, No. 2–3, 73–81, illus., English and Spanish summaries.

Most of the rice grown in Camargue is transplanted. Information is given on " cage-wheels " which consist of metallic lattice rollers 1·15-1·60 m. diameter and 0·90–1·20 m. wide, fitted with protecting ribs. They replace the rear wheels of a tractor and are used in mud before transplanting rice to improve soil condition and check the growth of weeds. Recently a new use has been found for cage-wheels in ploughing-in the residues of the rice crop after the passage of the combine. A third, smaller, cage-wheel is often placed at the back of the tractor to work the strip of soil between the 2 main cage-wheels. As the use of cage-wheels has several disadvantages, other mechanical devices are under trial. At the same time, there is a tendency to adopt direct sowing for rice, because of the difficulties encountered in transplanting, mainly due to scarcity of labour.—E.B.O.

697 Casella, A. Prospettive di sviluppo della meccanizzazione in risaia. [**Prospects for the development of mechanization in rice-fields (in Italy).**] *Atti Cent. naz. mecc. agric., Torino* 1956–7, **2**, 111–15, illus., English, French and German summaries.

The present position of mechanization in rice-growing in Italy is examined, and compared with that in other countries, mainly the USA and Morocco. Results are given from studies with seed-drills and combine-harvesters. It is concluded that, compared with broadcasting by hand, drilling saves neither time nor money but does facilitate weeding.—E.B.O.

698 Phillips, R. W. **The production and processing of rice. An international approach.** *World Crops* 1958, **10**, No. 12, 451–4, bibl. 9, illus.

The work undertaken by FAO in improving the production and processing of rice is reviewed. —A.M.H.

699 Parthasarathy, N. **Report to the Government of Indonesia on rice improvement.** *Rep. 874 FAO/ETAP* 1958, pp. 19.

The rice situation in Indonesia is reviewed. Methods of cultivation, varieties grown and qualities required for local conditions are described with notes on seed multiplication and distribution. Research, which began in 1956, is concerned with crossing *bulu* (the predominant group which occurs in Indonesia only) varieties and *indica* varieties. Further work was done to study : (a) sterility ; (b) the effect of light on seeds in producing earlier flowering ; (c) the effects of X-irradiation of seeds (all plants grew but 73% of *indica* and 33% of *bulu* were sterile; a few grew atypically). Recommendations are made on fertilizers (not hitherto

used), expansion of rice research, training of personnel, seed multiplication and distribution, and upland-rice production.—V.G.F.

700 Wilson, T. B. **The economics of padi production in north Malaya. 1. Land tenure, rents, land use and fragmentation.** *Bull. 103 Dep. Agric. Malaya* 1958, pp. 113, illus.

SETARIA VIRIDIS

701† Ermolov, V. G. [***Setaria viridis* — a valuable crop.**] [Russian] *Zemledelie* (*Agriculture, USSR*) 1958, **6**, No. 11, 52–3. [Balašov Agric. Exp. Sta.]

It is claimed that this plant is drought resistant and gives high yields of grain and hay. At the above Station [approx. 51°N. lat., 43°E. long.] during 1956–7 trials were carried out on several varieties of the grass [known in the USA as green bristle grass ; foxtail millet (*S. italica*) is the cultivated form], comparison being made with *Sorghum sudanense*. Crude-protein content in hay of the *Setaria* variety Bučanskaja was 15% compared with 12·6% in Sudan grass. In 2-yr. tests to study green- and hay-yields from *Setaria* grown on a flooded meadow [length of inundation not stated], the annual harvest of green matter was 2110 kg./ha. compared with 1890 kg./ha. from Sudan grass. A mixed sowing of *S. viridis* with *Lathyrus sativus* is recommended, the amounts being 60–70% of the normal sowings in pure stands (on unirrigated areas and when grown for grain, the sowing rate for *Setaria* is, on average, 5–6 kg./ha., but when grown for green feed, the rate should be 17–20 kg./ha.).—M.H.

CEREALS—GENERAL

702 Pessi, Y. and Kivinen, P. Leikkuuajan vaikutuksesta ohran, kauran ja syysrukiin satoon sekä sadon käyttöarvosta kylvösiemenenä. [**The influence of time-of-cutting on yields of barley, oats and autumn-sown rye, and the use of the grain as seed.**] *Valt. Maatalousk. Julk.* 1957, No. 161, pp. 48, bibl. 14, English summary. [Frost Res. Sta., Pelsonsuo, Finland] [Received Aug., 1958]

Results from the time-of-cutting tests relate to frost-free summers and summers with night frost. The following conclusions are drawn : tillering is possible in plants produced from grain which is the earliest to ripen ; grain yield increases with progressive ripening up to the time of full ripeness ; in late varieties of oats, the grain yield shows a steep rise up to the latest time of cutting, whereas in early varieties it tends to level out and may even decrease at the end of the growing period in favourable summers. When night frost occurs, the grain yield is lowered. The 1000-grain weight increases in approximate proportion to the grain yield. The plants developed from small seed may tiller and head 1–3 days later than plants grown from seed of normal size. At ripening, however, no differences are observed. In years in which the crop has ripened to the yellow stage before the start of night frosts, yields have been similar, on average, regardless of the 1000-grain weight, with the exception of one test with autumn-sown rye. If night frost has interrupted the development of the crops at the milk-white stage, the grain yield of barley and oats is smaller, with a smaller 1000-grain weight. This phenomenon is attributed to the fact that in small seed the development of the plants has lagged behind normal. The results with autumn-sown rye are affected by differences in hibernation, which cannot be ascribed directly to the 1000-grain weight. In the same period of time, a shorter and less sturdy shoot develops from a small seed than from a large one. The smaller seed has also a considerably lower dry-matter content. However, the straw yields of barley and oats are equal, on average, regardless of seed size. Although in barley (no other cereal was investigated) small seed produced plants with longer stalks than did large seed, no noteworthy differences occurred in stalk strength. F. s.—M.H.

703 National Institute of Agricultural Botany. **Cereal trials.** *Rep. and Accts Nat. Inst. Agric. Bot. 1957*, Cambridge, [n.d.], pp. 9–14. [Received July, 1958]

The characteristics of 11 winter-wheat, 5 spring-wheat, 3 winter-oat, 9 spring-oat and 6 spring-barley varieties are described.—A.M.H.

704 Jensen, L. A. and Stoa, T. E. **Crop variety characteristics [of wheat, barley, oats and linseed] and recommendations for North Dakota 1958.** *Circ. A–170* (*Revised*) *N. Dakota Agric. Coll. Ext. Serv. 1958*, pp. 2.

705 Junghans, K. H. Der Einfluss der Höhenlage auf den Ertragsverlauf der Weizen-, Gerste- und Hafersorten der DDR. [**The effect of altitude on yields of wheat, barley, and oat varieties in Eastern Germany.**] *Dtsch. Landw.* 1958, **9**, No. 10, 469–73, bibl. 3. [Univ. Halle-Wittenberg, E. Germany]

Following cereal-variety yield-trials at 3 altitudes (350, 500 and 650 m. a.s.l.) in the Harz Mountains, varieties of winter wheat, oats and winter- and spring-barley are tabulated according to their suitability for cultivation at these altitudes. —D.B.

706 Fürste, K. Möglichkeiten zur Abkürzung der Keimruhe bei Keimlingen von Getreidearten durch Entfernen der Kornhülle. [**The possibilities for shortening the period of dormancy in seeds of cereal species by re-**

moving the seed coats and hulls.] *Saatgut-Wirtsch.* 1958, **10**, No. 9, 247–51 and No. 10, 276–9, bibl. 14.

Methods for breaking dormancy in cereal grains were required in order to determine seed viability immediately after harvest (for purposes of seed certification and fixing the price of malting barley). The methods used consisted of removing hulls and/or gently shaving the caryopsis coat in dry or previously soaked grains ; low temperature treatment without hulling or shaving was also used. All grains, except the control or those subjected to low-temperature treatment, were given a cool treatment (4–8°C.) for several days and allowed to germinate for 10 days at 20°C. Viability after 6 months (in another series) was used as a standard for comparison. The results were expressed in a series of graphs, one for each of the 4 years of experiment, for each of winter barley, spring barley, oats, and winter rye. The graphs show the original degree of dormancy at harvest (by control series), the final viability after 6 months and the course of loss of dormancy by each treatment. The results (statistically analysed) were not uniform from year to year and varied from species to species. Of the mechanical methods tested, the only ones which proved practicable were : after preliminary soaking, (a) removal of hulls or (b) removal of hulls and gentle shaving of the caryopsis coat. It is concluded that the growth-inhibiting substance is present in the hull and external part of the caryopsis wall.—D.B.

707 Friesen, G. **An appraisal of losses caused by weed competition in Manitoba grain fields.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 40. [Univ. Manitoba, Winnipeg]

The results are given of estimates of crop losses caused by weed competition on 50 farm fields within a 60-mile radius of Winnipeg, Manitoba, during 1956–7. Yield reductions for wheat, barley, oats and oil-seed flax averaged 16% in 1956 and 17% in 1957. Wild oats, wild mustard [*Brassica arvensis*] and wild buckwheat [*Polygonum convolvulus*] were the most serious weed competitors. In 2 years' studies on the effectiveness of 2,4-D and MCPA for reducing weed competition, crop losses on 10 wheat fields were 5% for sprayed and 14·5% for unsprayed plots ; respective losses for barley (2 fields) were 10 and 15% and for oats (4 fields) 8 and 15%. In trials in 1957, weed-removal increased both yields and the protein content of the grain of wheat and barley.—P.J.B.

708 Kommedahl, T. and others. **Effects of quack grass rhizomes on germination and growth of crop seedlings.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 10. [Minnesota Agric. Exp. Sta., St. Paul]

In field trials, stands of 3 wheat varieties grown on land previously infested with *Agropyron repens* were one third, and dry weights per plant one half of those on land not previously infested. In glasshouse trials, 3-week-old wheat seedlings were 5 cm. taller on non-infested soil than on soil previously infested, but from which rhizomes of *A. repens* had been removed ; autoclaving did not eliminate this effect. Adding 20 g. of dried, ground *A. repens* rhizomes to non-sterile soil in pots resulted in 4% germination in Selkirk wheat after 4 days, compared with 71% for controls. These differences were apparent for about 1 week, only, where sterile soil was used, but persisted longer on unsterilized soil. In field trials with oats, stands of 3 varieties grown on previously-infested land were 25%, and dry weight per plant 50%, of those on non-infested soil. Barley was more adversely affected than wheat and oats, largely due to greater severity of attack from pathogenic fungi on infested than non-infested soil. With oil-seed flax grown in the field, stands on soil previously infested with *A. repens* were similar to those on non-infested soil, but dry weights per plant on infested soil were only 10% of those on uninfested soil. —P.J.B.

709 Arai, M. and Kataoka, T. **Changes of weed communities by methods of cultivation in winter cropping on drained paddy fields. 1. Influence of plowing time on the structure of weed communities and the quantity of weeds.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 3, 203–4, bibl. 11, English summary. [Kanto-Tosan Agric. Exp. Sta.]

The number of weeds [in a cereal stand] decreased markedly as the date of ploughing [of the drained paddy field] was postponed ; this is accounted for by decreased percentage emergence with reduction in air temperature. In warm regions, delayed ploughing can be an effective means of weed control in wheat and barley fields, the growth and yield of the crop being scarcely affected by delayed sowing. F. Eng. s.—D.B.

710 FAO. **Report of the second FAO meeting on the control of the sunn pest of cereals. Teheran, Iran 14-23 April, 1958.** *Meet. Rep. 1958/4 FAO* 1958, pp. 25.

An account is given of trials to control the sunn pest (mainly *Eurygaster* spp. and *Aelia* spp.) by insecticidal treatment in various eastern countries. Although this treatment gave satisfactory control, its cost was very high. It was recommended that investigations should be continued. [See also *Fld Crop Abstr.* 11 : 468.]—E.B.O.

711 Zogg, H. Fusskrankheiten des Getreides. [**Root rots of cereals.**] *Mitt. schweiz. Landw.* 1958, **6**, No. 8, 113–19, illus. [Eidg. Landw. Versuchsanst. Zürich-Oerlikon]

Diseases caused by *Ophiobolus graminis*, *Cercosporella herpotrichoides* and species of *Fusarium*, *Wojno-*

wicia and *Leptosphaeria* are controlled only by suitable rotations, examples of which are given. These are based on the principle that 3–5 yr. should elapse between 2 crops susceptible to the diseases.—D.B.

712† Jenkins, C. F. H. **The webworm (*Talis pedionoma* Mayr.).** *J. Dep. Agric. W. Aust.* 1958, **7**, 415–21, bibl. 3, illus.

Webworms, which cause damage to cereal crops sown on ploughed-in pasture, can be controlled by early sowing, preferably after clean fallow, or by delaying sowing for a fortnight or longer after ploughing. Spraying with 6–8 oz. DDT in 2–10 gal. water per ac. is recommended. A DDT/superphosphate mixture at 90 lb. 0·25% dust per ac. gave good control of webworm damage in pasture.—A.M.H.

713 Stroun, M. Rôle de la composition du spectre lumineux dans la ramification de l'épi de céréales. [**Role of the composition of the light spectrum in the branching of cereal ears.**] *Bull. Soc. bot. Fr.* 1958, **105**, No. 1–2, 1–9, bibl. 27, illus.

Many authors have attributed the occasional branching of cereal ears to a change in the equilibrium between growth and development during the photophase. Contrary to this belief, in a study with wheat and barley it was found that the daily duration of light (the photophase) influences development from the end of vernalization to the appearance of the spikelet initials but not further. From the appearance of the spikelet initials to the end of the gonadogenesis, the determining factor is the quality of the light spectrum—the spectrophase. The cases of ear branching observed were due to a change in the equilibrium between growth and development during the spectrophase and not during the photophase. In long-day plants the processes which take place during the spectrophase are favoured by long-wave radiations.—E.B.O.

714 Davidescu, D. L'efficacité des engrais phosphatiques sur les céréales en Roumanie. [**The effectiveness of P fertilizers on cereals in Romania.**] *2nd Internat. Symp. Phosph. Nutr. Plants* Isola d'Elba, Italy, Sept. 1958, pp. 2. [Fac. Agric. Hort., Bucarest]

Cereals are grown on almost 75% of the arable land in Romania. Information, based on results from many trials, is given on the effectiveness of P fertilizers on cereals grown on different types of soil. The highest response was shown by wheat, followed by oats, barley and maize. Wheat yields were increased by 261–620 kg. of grain per ha. by applying 36–50 kg. P_2O_5 per ha.—E.B.O.

715 Primost, E. Die Bedeutung der morphologischen Ertragsanalyse für die Auswertung von Düngungsversuchen. [**The importance of morphological yield-analysis in the evaluation of manurial trials.**] *Z. PflErnähr. Düng.* 1958, **82**, No. 1, 1–10, bibl. 19. [Landw. Versuchsstation Steyr, Österreichische Stickstoffwerke A.G., Linz/Donau]

In manurial trials with wheat, rye and spring barley it was shown that number of ear-bearing stalks per unit area was the most important character for the morphological evaluation of response to increasing quantities of fertilizer. It was followed by the number of grains per ear. Weight of grain gave the least indication of response to fertilizer. The yield depression which sets in when the optimum dose of fertilizer has been exceeded is related to the yield per ear (number of grains per ear and grain weight). F. Ger. s.—D.B.

716 Sheldon, W. H. and Hall, C. W. **Airflow from a wind-driven rotary ventilator for aeration of grain.** *Quart. Bull. Mich. Agric. Exp. Sta.* 1957, **40**, No. 2, 256–8, illus.

The relationship between air flow and static pressure for a 16-in. wind-driven rotary ventilator, for wind velocities between 4 and 13 mph., is shown in the form of a graph. At a wind-velocity of 8 mph. the quantity of air withdrawn (20 cfm.) was sufficient to maintain uniform temperature conditions in 1000 bu. grain. At a wind-velocity of 10 mph. the air withdrawn (60 cfm.) was sufficient for 3000 bu. grain. When used as a power-driven exhaust-fan, the ventilator speed required to exhaust a similar quantity of air was 70% greater than when wind-driven.—R.B.

LEGUMES

COWPEAS

See also Abs. 749

717 ter Horst, K. Producties van enige peulvruchten op het Lelydorpplan in 1957. [**Productivity of some legumes on the Lelydorpplan [Surinam] in 1957.**] *Surinaam. Landb.* 1958, **6**, No. 1, 28–9.

Varietal trials of *Vigna sinensis* and *Phaseolus radiatus* are reported. The high yields obtained are attributed to the favourable distribution of the rainfall in 1957.—G.M.R.

SOYABEANS

See also Abs. 749, 968, 976, 1016

718 Tanganyika Agricultural Corporation. **Agronomy. Soyabeans.** *Rep. Tanganyika agric. Corp. 1956–7*, Dar-es-Salaam, 1958, 28. [Exp. Fm, Nachingwea]

Yield increased from 85 lb./ac., after a growth period of 90 days, to 1258 lb./ac. after 120 days.

The rate of increase declined at about 114 days, when the plants were mature.—A.M.H.

719 Jensen, L. A. and others. **Soybean production in North Dakota.** *Circ. A–250 (Revised) N. Dakota Agric. Coll. Ext. Serv.* 1958, pp. 6.

Recommended varieties and cultural practices are given.—R.B.

720 Mitrović, A. Uticaj gustine i načina setve na morfološke osobine i prinos soje na području južnog Banata. [**The effect of density and method of sowing on the morphological features and yield of soyabean in South Banat.**] *Arhiv polj. nauke* 1958, **11**, No. 33, 44–54, bibl. 4. English summary.

In this region of the Yugoslav/Romanian border [approx. 45° N. lat. 21° E. long.] the highest yield of soyabeans was obtained from populations of 267,000 plants/ha., i.e. with a vegetation area of 375 cm.^{2} per plant. This was achieved by sowing 40 kg. seed per ha., at a spacing of 50–60 m. between the rows.—M.H.

721 Wiltse, M. G. **Some effects of herbicidal oils on beans.** *Diss. Abstr.* 1958, **19**, No. 1, 30. [Michigan State Univ., Ann Arbor]

A study of the herbicidal effects of 32 oils was made on soyabeans. Mineral oil containing 10 or 15% indocene 70, 10% indosolvent 2, 40% alkylate + 20% indosolvent 2, or pure heavy naphtha, gave 75% weed control, while causing very little injury to the soyabean stems. Resistance of the stems to oil appeared to decrease with the age of the plant. The best weed control was achieved by spraying when the soyabean plants developed the first trifoliate leaf. Herbicidal oil applied at 10 gal./ac. gave better weed control than oil at 5 gal./ac. and less injury to soyabeans than oil at 20 gal./ac. A further application of oil caused slightly more soyabean injury but no decrease in yield. Symptoms of oil injury to soyabeans included : wilting ; breakdown of cells in the epidermis, cortex, phloem and vascular cambium; and reversion to meristematic activity in cells adjacent to those injured. More injury was caused to soyabean plants by spraying at 70° and 80°F. than at 60°F., and more when the stem stomata were open than when they were closed. *Ambrosia artemisiifolia* appeared to be resistant to oil-spraying. —R.B.

722† Bergersen, F. J. **The bacterial component of soybean root nodules ; changes in respiratory activity, cell dry weight and nucleic acid content with increasing nodule age.** *J. gen. Microbiol.* 1958, **19**, No. 2, 312–23, bibl. 17. [Div. Pl. Industr., CSIRO, Canberra, Australia]

During the 6- to 7-week active life of soyabean root-nodules produced by a single strain of *Rhizobium japonicum*, the respiratory activity of the bacteria isolated from the nodules changed according to a definite pattern : a depression occurred 2 weeks after the nodules first appeared followed by a rise, and with a further sharp rise 1 week before nodule breakdown. The initial depression coincided with the beginning of N fixation. The limits within which respiration varied depended on host-plant growth. The N-fixation rate remained constant from 2–3 weeks after nodule appearance until a few days before nodule decay began. F. s.—E.B.O.

GROUNDNUTS

See also Abs. 937, 966, 968, 976

723 Tanganyika Agricultural Corporation. **Agronomy. Groundnuts.** *Rep. Tanganyika agric. Corp. 1956–7*, Dar-es-Salaam, 1958, 27–8. [Exp. Fm, Nachingwea]

Spacings of 2, 4, 6 and 8 in. between plants in the row were used. Highest yields came from plants spaced 2 in. apart. This spacing was produced by a sowing rate of 100 lb./ac. Increasing sowing rates above the normal 50 lb./ac. (4-in. spacing between plants) would give adequate returns only if the crop could be harvested within a few days of the optimum harvest date. There was no indication that spacing influenced the growth period. The maximum yield came from plots harvested 102 days after sowing.—A.M.H.

724 Stern, W. R. **Factors influencing cropping in a tropical environment.** *J. Aust. Inst. agric. Sci.* 1958, **24**, No. 3, 264.

The problems of establishment and of fluctuating yields, within and between seasons, of crops grown on Tippera clay loam at Katherine, Northern Territory, were investigated. Groundnuts and sorghums were sown at daily intervals over a period of 11 weeks in the 1954–5 season, and at selected intervals in 1955–6, and yields and the development of individual plants were recorded. The results suggested that a marked drop in temperature at the end of the season inhibited peg development in groundnuts and prevented the fruit from developing further. In sorghum, the first limitation on yield occurred during the period prior to head initiation and may be due to the influence of daylength. F. thesis s., Univ. Sydney. —A.M.H.

725 Mazzani, B. and Cobo, Margarita. Características varietales del maní. [**Varietal characteristics of groundnuts.**] *Agron. trop., Maracay* 1957, **7**, No. 3, 109–49, bibl., 9, illus., English summary. [Cent. Invest. Agron., Maracay, Venezuela]

About 200 groundnut varieties, grown at the

above centre, are described. Their provenance is given.—E.B.O.

726 TELLA, R. and CANECCHIO, V. Ensaios de variedades de amendoim. 4. Décima segunda e décima terceira séries de ensaios. [**Varietal trials with groundnuts. 4. Twelfth and thirteenth series of trials.**] *Bragantia* 1957, **16**, No. 25, 377–83, bibl. 4, English summary.

In trials to test 10 groundnut varieties in Campinas, Ribeirão Prêto and Presidente Prudente, São Paulo State, Brazil, in 1955–7, the variety Paulista–269 was outstanding with an average yield of 3375 kg. unshelled nuts per ha. and 41·1% oil content in the seed. Other promising varieties were Bandeirante–263, Centenário–264, Brasília–265, Virgínia–266 and Tatuí–76.—E.B.O.

727 DIECKERT, J. W. and MORRIS, N. J. **Bitter principles of the peanut** [*Arachis hypogaea*]. **Isolation, general properties, and distribution in the seed.** *J. agric. fd Chem.* 1958, **6**, No. 12, 930–3, bibl. 11. [Agric. Res. Serv., U.S. Dep. Agric., New Orleans]

728 CONAGIN, CÂNDIDA H. T. M. Desenvolvimento da semente do amendoim cultivado, *Arachis hypogaea* L. [**Development of the seed of cultivated groundnuts** (*A. hypogaea*).] *Bragantia* 1957, **16**, No. 2, 15–33, bibl. 6, illus., English summary.

This is a cytological study of the development of groundnut seed, carried out with the varieties Tatu (V. 53), NC–4 (V. 263) and B–33 (V. 265). The development stages examined ranged from 10-day old ovaries to mature seeds.—E.B.O.

729 KATAYAMA, Y. and NAGATOMO, T. **A comparison of oil contents in different stages due to growing habits and strains of peanuts.** [Japanese] *Bull. Fac. Agric. Univ. Miyazaki* 1958, **3**, Nos. 1–2, 61–8, bibl. 8, English summary.

In 33 strains of groundnuts (*Arachis hypogaea*) belonging to 4 growth types, the oil- and water-content of the seeds was determined at intervals during germination. Oil content and water content were inversely proportional to each other. The rate at which oil was used up during germination was slower in erect than in prostrate types. Irrespective of variety and growth habit, the seeds attained their maximum oil-content (45% of dry weight) 60 days after flowering. F. Eng. s.—D.B.

730 BOLHUIS, G. G. **Observations on the flowering and fructification of the groundnut,** *Arachis hypogaea*. **2.** *Neth. J. agric. Sci.* 1958, **6**, No. 4, 245–8, bibl. 4. [Lab. Trop. Agric., Wageningen, Netherlands]

Flowers produced by bunch-type groundnut plants of the variety Schwarz 21, grown in pots, were counted and then removed to prevent fruit-setting. The plants continued to flower throughout their life-span, and the number of flowers produced per plant often exceeded 1500, compared with 60–80 in plants which were allowed to set fruit. The life of these plants could be prolonged to more than 12 months by preventing fruit-setting.—R.B.

731 KATAYAMA, Y. and NAGATOMO, T. **Change of growing habit in peanuts according to their development and some other conditions.** [Japanese] *Bull. Fac. Agric. Univ. Miyazaki* 1958, **3**, Nos. 1–2, 69–76, bibl. 5, English summary.

A study was made of the effect of density of planting, intervarietal competition, and treatment with MH-30 (1% solution) on the growth habits of 4 growth types of groundnut (*Arachis hypogaea*). Changes were observed in the branching of the main stem and lateral branches. F. Eng. s.—D.B.

PEAS

See also Abs. 747, 888, 904, 910, 949, 960

732 NORFOLK AGRICULTURAL STATION. **Row width and weed control for vining peas.** *Rep. Norfolk Agric. Sta. 1957–58*, Sprowston, 1958, 10–11.

Peas sown in rows 7 in. apart have consistently yielded about 2 cwt. green peas/ac. more than those in 14-in. rows. Dinoseb amine (2 lb./ac.) gave good control of chickweed [*Stellaria media*], knot-grass [*Polygonum aviculare*] and black bindweed [*P. convolvulus*] and increased yields by 2–3 cwt./ac. even when weed growth in the early stage of the crop was relatively small. In terms of crop yields, the herbicidal treatment was equally effective in crops grown at either row width. In the wide rows, weeds between the rows were also controlled by hand-hoeing, but spraying apparently gave some benefit in the control of weeds in the rows themselves.—A.M.H.

733 RIEPMA WZN, P. Doperwtenrassenonderzoek (Serie 194) in 1957. [**Green-pea variety trial (Series 194) in 1957.**] *Gestenc. Versl. 58 Proefsta. Akker. Weidebouw* 1958, pp. 11, bibl. 3, mimeo.

The results of three trials are reported. The highest mean yield was obtained from Mansholt's × 2117, Kelvedon Wonder and Juwel. Celsior, included in one trial only, appeared to be equal to the foregoing. Alaska, a very early variety, gave hardly 60% of the pea yield but 70% of the pod yield of the 3 most productive varieties. In pea yield, Pauli and Finette occupied an intermediate position between the productive varieties and Alaska. For seed production, field peas are more productive than canning peas, and in these trials the canning peas gave a seed yield 19–33% lower than that of the field-pea variety Pauli.—G.M.R.

734 Allen, F. C. **Problem of mixed weed populations in crops.** *Proc. 11th N.Z. Weed Contr. Conf.* 1958, 85–9. [Canterbury (N.Z.) Seed Co. Ltd.]

The possible consequences of the selective action of herbicidal treatments on the mixture of weeds found in cereal and pea crops are discussed. Trouble from broad-leaved weeds is unlikely in cereals, provided the chemicals at present available are used correctly and due regard is paid to the encouragement of crop vigour. Danger is seen in the large-scale use of MCPB for weed control in peas. More use should be made of dinoseb, especially in districts where two or more pea crops are grown in the rotation. Complete suppression of weed seeding is recommended as the minimum standard for weed control. F. s.—m.h.

735 Statens Forsøgsvirksomhed i Plantekultur. Denmark. Allylalkohol til bekæmpelse af ukrudt. [**Controlling weeds with allyl alcohol.**] *Medd. 606 Stat. Forsøgsvirk. Plantekult.* 1958, pp. 4.

The results are given of trials in Denmark during 1957–8 on the use of allyl alcohol for killing weed seeds in the soil. Crops used included peas. With these, 10 ml. allyl alcohol in 5 l. water per $m.^2$ were applied as follows : (a) 6 days before sowing, (b) at the time of sowing, and (c) 3 days after sowing. Treatments (b) and (c) completely killed the peas. Treatment (a) was tolerated by the peas and the amount of weeds present was reduced to 25% of that on untreated plots. The practical recommendations made as a result of these trials were as follows : allyl alcohol should be applied to tilled soil before the germination of the weed seeds and at least 4 days before crops are sown. The optimum dose of allyl alcohol is between 5 and 10 ml./$m.^2$, in 5 l. water. Applying allyl alcohol in bands 10 cm. wide along the crop rows gave good results.—p.j.b.

736 Nelson, D. C. and Nylund, R. E. **Competition effects of mustard and foxtail millet on processing peas.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 41–2. [Univ. Minnesota, St. Paul]

In trials during 1956 and '57, peas were grown in competition with different populations of *Brassica hirta* and *Setaria italica*. *B. hirta* was a far more effective competitor with peas than *S. italica*. This was partly because of the rapid emergence of *B. hirta* (2–5 days before the peas), compared with the slow emergence of *S. italica* (10–30 days after the peas). Also, *B. hirta* was able to grow rapidly in low May temperatures. Low populations of *B. hirta* were able to reduce yields of shelled peas, even where removed when the peas were in the 9–10 node stage.—p.j.b.

737 Buxton, E. W. and others. **Getting the better of the pea wilt.** *Fmr's Wkly, Lond.* 1959, **50,** No. 5, 88–9, illus.

Examples are given of varieties of peas resistant and susceptible to pea wilt caused by *Fusarium oxysporum* f. *pisi*. The only effective control at present is to practice a long rotation—at least 8 years between pea crops—or to grow wilt-resistant varieties.—c.l.s.

738 Virtanen, A. I. and Holmberg, Ann-Marie. **The quantitative determination of molecular nitrogen fixed by pea plants in pot cultures and in field experiments.** *Suomen Kemistilehti* 1958, **B31,** 98–102, bibl. 2. [Biochem. Inst., Helsinki, Finland]

The results are recorded of tests in which an attempt was made to determine how much of the N contained in pea plants was obtained by effective root nodules as molecular N from the atmosphere and how much by the roots as combined N from the soil. In field experiments on light clay, rich in humus and without any N fertilizer, pea plants obtained only about 10% of their N from the soil and nearly 90% from the atmosphere. In pot experiments with different types of soil, the amount of N obtained by the effective root nodules from the atmosphere varied from 69 to nearly 90% of the total N. N-fixation depended on the combined N available in the soil. The ability of the roots of the pea to take up nitrogenous nutrients from the soil is surprisingly low if the soil does not contain very large amounts of nitrate- or ammonium-N. A pea plant without effective root nodules grows poorly in a soil in which, for instance, oats give a good crop without N fertilization. The growing of peas without effective nodules is, therefore, impossible in practical farming. [See also *Fld Crop Abstr.* 6 : 604.] F. s.—m.h.

739 North, C. and others. **The assessment of yield in canning-pea varieties in Scotland.** *J. hort. Sci.* 1958, **33,** No. 4, 237–43, bibl. 11. [Scottish Hort. Res. Inst., Invergowrie, by Dundee]

Yield trials were carried out with 5 pea varieties in 1954 and 7 varieties in 1955–7. Each variety was harvested as nearly as possible at the " Practical Canning Stage " (P.C.S.), which was taken as the stage at which the alcohol-insoluble-solids content was 13·5%. When picking at this stage was not possible, the yields were adjusted accordingly. The varieties fell into 3 maturation groups : early, Gregory's Surprise and Kelvedon Wonder ; mid-season, Witham Wonder, Monarch Canner and Wando ; maincrop, Lincoln and Canner's Perfection. The highest-yielding varieties in the 3 groups were, respectively, Kelvedon Wonder (except in 1955), Monarch Canner and Lincoln. Varietal differences in the ratio of haulm weight to pea weight were rather inconsistent, but Monarch Canner consistently gave a rather low ratio. The value of the texture meter for determining the P.C.S. of pea crops is discussed.—a.m.h.

BEANS

See also Abs. 749, 872, 949

740 HAYWARD, P. R. **Winter beans, seed-rate and manuring trial.** *Rep. exp. Wk Throws 1955–6 and 1956–7*, Little Dunmow, Essex, [n.d.], pp. 6–7. [Received July, 1958]

Yield was roughly proportional to seed rate, up to 4 bu. /ac., and the limit of the correlation was not reached. At a seed rate of 4 bu./ac. and 21-in. row-spacing, yield was 33·4 cwt./ac. Narrower row-spacing was recommended for higher seed rates.—A.M.H.

741 NATIONAL INSTITUTE OF AGRICULTURAL BOTANY. **Legume trials.** *Rep. and Accts Nat. Inst. Agric. Bot. 1957*, Cambridge, [n.d.], pp. 14–16. [Received July, 1958]

Mixtures of winter beans and winter oats yielded more than either constituent grown alone. The protein content of the kernels was higher in oats grown with beans than in oats grown alone.—A.M.H.

742 MÜLLER, H. J. **The behaviour of *Aphis fabae* in selecting its host plants, especially different varieties of *Vicia faba*.** *Ent. exp. et appl.* 1958, **1**, No. 1, 66–72, bibl. 8, German summary. [Inst. PflZücht., Quedlinburg, E. Germany]

Winged forms of the bean aphid, *Aphis fabae*, landed in equal numbers on field beans of the varieties Schlanstedter and Rastatter growing in the field ; 99% of the aphids flew from the latter within a few minutes, whereas only 90% left the former.—R.B.

743 TAMBS-LYCHE, H. and KENNEDY, J. S. **Relations between growth pattern and resistance to *Aphis fabae* Scopoli in three varieties of field bean (*Vicia faba* L.)** *Ent. exp. et appl.* 1958, **1**, No. 3, 225–39, bibl. 19. [Agric. Res. Counc. Unit of Insect Physiol., Dep. Zoology, Cambridge]

Of 3 varieties of spring field beans, grown in a small field trial, Schlanstedt[er] was the first to flower and fruit, Rastatt[er] was intermediate, and an unnamed variety of English tick bean was last. The tick bean produced the most shoots, leaves and flowers. Yields of Schlanstedt[er] Rastatt[er] and tick beans were 65, 61, and 46 g. per plant, respectively. The relative incidence of *Aphis fabae* among the organs of one variety and also between varieties was correlated with the growth pattern; in Rastatt-[er], which showed the lowest level of infestation, growth was more equally divided between shoots and fruits, and less vigorous, in the individual plant parts, during the critical weeks of infestation than in the other 2 varieties. The sap of Rastatt[er] at this stage may have been less nutritious for *A. fabae* than that of the other varieties. The aphid *Acyrthosiphon pisum*, which infested bean plants later in the season, preferred Rastatt[er] to Schlanstedt[er] ; tick beans were an intermediate preference. Selection of field beans for vigorous growth and high yields appears to have increased their susceptibility to aphid infestation.—R.B.

744 MÜLLER, H. J. Über die Ursachen der unterschiedlichen Resistenz von *Vicia faba* L. gegenüber der Bohnenblattlaus, *Aphis* (*Doralis*) *fabae* Scop. 5. Antibiotische Wirkungen auf die Vermehrungskraft. [**The causes of bean aphid (*Aphis fabae*) resistance in *Vicia faba*. 5. Antibiotic effects on reproductive capacity.**] *Ent. exp. et appl.* 1958, **1**, No. 3, 181–90, bibl. 14, illus., Eng. summary. [Inst. PflZücht., Quedlinburg, E. Germany]

The rates of development and parthenogenetic reproduction of wingless bean aphids feeding on the first-formed leaves of glasshouse-grown *Vicia faba* seedlings were much greater on Schlanstedter than on Rastatter beans where the seedlings had intact roots, but on cut seedlings of both varieties supplied with tap-water the rate of reproduction and development were similar, and were greater than on rooted Schlanstedter seedlings. These effects were considered to be due to changes in the nutrient content of the phloem. [See also Abs. 742.] —R.B.

LUPINS

745† CORBETT, M. K. and EDWARDSON, J. R. **Virus diseases of yellow lupine : preliminary investigation on control by the use of a protecting border.** *Proc. Soil and Crop Sci. Soc. Fla* 1957, **17**, 294–301, bibl. 23. [Florida Agric. Exp. Sta., Gainesville] [Received Nov., 1958]

Virus-free seed of Weiko III sweet yellow lupin (*Lupinus luteus*) and commercial seed, 2–6% of which was infected with bean yellow mosaic virus, were sown in 0·125-ac. plots, with or without a 24-ft. border of Floriland oats. Average lupin seed yields, in lb./ac., were 821 for Weiko III protected by the oat border, ; 430 for Weiko III unprotected ; 87 for commercial seed protected ; and 121 for commercial seed unprotected. The final % of plants infected was reduced from 99 in the unprotected Weiko III plots to 13 in the protected plots. With commercial seed the protecting border had no effect on % infection.—A.M.H.

LEGUMES—GENERAL

746 SILVESTRE, P. Note sur la production des légumineuses à graines alimentaires dans les territoires français d'Outre-mer et leur commerce avec la Métropole. [**Note on the production of pulses in the French overseas territories and their trade with metropolitan France.**] *Riz et*

Rizicult. 1958, **4**, No. 2–3, 97–104, illus., English and Spanish summaries.

The growing of pulses is important in tropical countries, the principal species being *Vigna sinensis, Dolichos lablab, Phaseolus lunatus* and *Voandzeia subterranea*, but their trade with metropolitan France is small, with the exception of *Ph. vulgaris* and *Ph. lunatus*, both grown in Madagascar.—E.B.O.

747† Bos, L. and Want, J. P. H. van der. Virusziekten van vlinderbloemigen. 1 en 2. [**Virus diseases in legumes. 1 and 2.**] *Landb Voorl.* 1958, **15**, No. 10, 550–8, illus., and **15**, No. 11, 573–86, bibl. 14, illus. [Inst. PlZiektenk. Onderz., Wageningen, Netherlands]

Recommendations for the prevention of virus diseases in legumes are : (1) removal of infected plants ; (2) isolation of sensitive crops from areas where viruses are liable to overwinter, e.g., peas should not be grown near lucerne where the pea leaf roll virus and its vector, the pea aphid [*Acyrthosiphon pisum*] are likely to occur; (3) sowing certified seed, preferably of resistant varieties ; (4) employing a long rotation if the virus diseases can overwinter in the soil ; (5) sowing crops as early as possible so that they will be well-developed before the first flying aphids appear, and growing in close stands so as to discourage these insects. Descriptions are given of the principal legume virus diseases occurring in the Netherlands. Recommendations for their control are given.—R.B.

748† Dehay, C. and Care, M. Étude de la composition des excrétions radicellaires chez quelques légumineuses d'origine africaine. [**Study of the composition of the root excretions of some legumes of African origin.**] *C.R. Acad. Sci., Paris* 1958, **247**, No. 3, 336–8, bibl. 3.

Centrosema plumieri, Crotalaria spectabilis, C. astragalina, C. retusa, Cassia hirsuta, C. occidentalis, C. obtusifolia, Mucuna utilis and *Canavalia gladiata* were among the species studied. The root excretions, diffused in distilled water and studied by chromatography, showed an abundance of amino acids. The most frequent of these were aspartic acid and glutamic acid, and citric acid among the organic acids.—E.B.O.

749† Galli, F. Inoculações cruzadas com bactérias dos nódulos de leguminosas tropicais. [**Cross-inoculation with nodule bacteria of tropical legumes.**] *Rev. Agric., Piracicaba* 1958, **33**, No. 3, 139–50, bibl. 23, illus., English summary.

An account is given of cross-inoculation trials with Rhizobia from local, or introduced, legumes of interest for cultivation in Brazil. Twenty-three bacterial strains of Rhizobia were isolated from 13 legume species, and cross-inoculation tests were made between these bacteria, their host plants and Rhizobia and plants belonging to the following cross-inoculation groups : soyabean, lucerne, clover, lupin, bean, pea and cowpea. The following conclusions were drawn : (a) there were differences between the morphological characteristics of the nodules of some legume spp. ; (b) *Calopogonium mucunoides, Centrosema pubescens, Desmodium adscendens, D. discolor, Indigofera mucronata, I. subulata, I. sumatrana, Stylosanthes guyanensis, Tephrosia candida* and *Teramnus uncinatus* belong to the cowpea cross-inoculation group ; (c) *Vicia obscura* belongs to the pea (*Pisum sativum*) group ; (d) *Leucaena glauca* and *Cratylia floribunda* belong to other cross-inoculation groups to which no other species studied in this work belong.—E.B.O.

750† MacConnell, H. M. and others. **The amino-acid composition of some Pakistani pulses. 2. Cystine content.** *J. Sci. Fd Agric.* 1958, **9**, No. 11, 739–42, bibl. 14. [Fac. Agric., McDonald Coll., McGill Univ., Quebec, Canada]

[See also *Fld Crop Abstr.* 10 : 1425]

751† Kamata, E. **Morphological and physiological studies on nodule formation in leguminous crops. 3. Classification on the basis of the location and origin of nodule formation. 4. Factors determining the site of first infection cells in nodule formation.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 4, 255–8 and 258–60, bibl., illus., English summaries. [Univ. Tokyo]

ROOT CROPS

SUGAR-BEET

See also Abs. 888, 1066, 1073

752 Norfolk Agricultural Station. **Sowing sugar beet at low seed-rates using a precision drill.** *Rep. Norfolk Agric. Sta. 1957–58*, Sprowston, 1958, 8–9.

Theoretically the spacings used were : (a) 1·5 in., (b) 2·25 in., (c) 4·5 in., (d) alternate 2 in. and 7 in., (e) 2 in. – 3·5 in. – 3·5 in. – 2 in. In practice the spacings were slightly wider than these. The seed rates varied from 6 to 1·5 lb. rubbed and graded seed/ac. Compared with spacing (a), savings in singling time were 8, 14, 17 and 8%, respectively, for spacings (b), (c), (d) and (e). The losses in plant population/ac. were 1700, 3500, 4600 and 4700, respectively, for each of the 4 spacings. None of these decreases gave any decrease in root- or sugar-yields. The importance of good working conditions for precision drilling at low seed rates was particularly apparent in 1958.—A.M.H.

753 Suikerbiet. Zaaizaadadvies. [**Advice about sowing sugar-beet seed.**] *Suikerbiet* 1958, **11**, No. 8, 64–6.

Polyploid strains of sugar-beet have larger seed-clusters than most diploid strains. The seed

clusters of diploid Zwaanesse III are larger than those of the polyploid strains and produce more multiple seedlings. Therefore, the quantity of seed required to produce a good stand varies according to variety. The percentage of seed-clusters producing single seedlings, and the relative quantity of seed required to give the same plant stands as Hilleshög Standard, are, respectively : Hilleshög Standard, 34 and 100 ; Hilleshög R, 33 and 100 ; Kleinwanzleben E, 27 and 108 ; Zwaanesse III, 18 and 122 ; Hilleshög R polyploid, 44 and 144 : Hilleshög Standard polyploid, 49 and 141 ; Kleinwanzlebener Polybeta, 58 and 142 ; and Maribo polyploid, 55 and 134.—R.B.

754 Loomis, R. S. and others. **Sugar beets in Imperial Valley : effects of preharvest irrigation and nitrogen fertilization studied in relation to increasing sugar yield in hot climate.** *Calif. Agric.* 1958, **12**, No. 8, 7. [Univ. California, Davis]

Yields and sucrose content of sugar-beet (a) irrigated every 2 weeks until harvest and (b) left unirrigated after late May, were compared. N was applied at 80 lb./ac. in early May. Under treatment (b) root yields did not increase after 21 June, and from that date until harvesting the beet leaves wilted severely during the day but recovered at night ; the development of new leaves was checked, and by 2 Aug. the plants retained only a few green leaves. Under treatment (a) leaf development continued vigorously until 2 Aug., and root yield continued to increase until that date, when it was 40·4 tons/ac.; the increase in yield from 7 June, when differential treatment began, was 10·1 tons/ac., 7·2 tons/ac. more than the yield increase of (b). On 7 June, the percentage sucrose content of all beets was 14; in (b) it increased to 14·9 by 5 July and then declined, while in (a) it declined continuously from 7 June. The total sugar yield of (a) did not begin to exceed that of (b) until more than 6 weeks after the final irrigation of the (b) plots.—R.B.

755 National Institute of Agricultural Botany. **Varieties of sugar beets.** *Fmrs' Leafl. 5 N.I.A.B.*, 1958, pp. 4.

Ten recommended and 6 provisionally recommended varieties are listed and their characteristics briefly described.—A.M.H.

756 Grimm, H. Trockenes Rübensaatgut durch Hockenabdeckung mit Kunststoffolie. **[Covering stooks with polythene sheets for producing dry beet seed.]** *Landbauforschung* 1958, **8**, No. 1, 9–11, bibl 6, illus. [Inst. PflBau u. Saatguterzeugung, Völkenrode, W. Germany]

757 Arndt, F. Untersuchungen über die Eignung verschiedener Herbizide im Vor-Auflaufverfahren zur Unkrautbekämpfung in Rüben, Zwiebeln und Möhren. **[The suitability of various herbicides in pre-emergence trials for controlling weeds in (sugar)-beet, onions and carrots.]** *Thesis, Landw. Hochsch. Hohenheim*, 1958, pp. 112, bibl. 105, illus. [Inst. PflSchutz, Landw. Hochsch. Hohenheim, Stuttgart, W. Germany]

758 Gould, W.L. **Developments in weed control in sugar beets.** *Range Mgmt Issue 106 Wyoming agric. Exp. Sta.* 1957. [Univ. Wyoming, Laramie]

The effect on stand, yield and weed control of placing DCU and dalapon [rates not stated] at depths of 1·5 and 3 in. during sugar-beet sowing was investigated. Emergence, stands at harvest and yields of beet were not adversely affected by the chemical treatments. DCU placed 3 in. deep was more effective as a herbicide than dalapon and gave 75% control of grass growth ; at 1·5 in. there was less control of grass growth and sugar-beet growth was somewhat depressed. Dalapon placed 1·5 in. deep was more toxic to grasses, and depressed beet growth less, than when placed 3 in. deep. Glasshouse studies indicated that DCU was unpredictable, and dalapon ineffective, in controlling *Avena fatua* at the rates used. DCU at 7·5 lb./ac. placed 3 in. deep, or dalapon at 3 lb./ac. placed 1·5 in. deep, were as effective in controlling annual grasses as a surface application of 14·6 lb. DCU/ac. The amount of weed control achieved was insufficient for commercial purposes.—R.B.

759 Butterfass, T. Die praktische Ermittlung des Ploidiegrads von Zuckerrüben durch Zählen der Schliesszellen-Chloroplasten. **[Determination of the degree of polyploidy in sugar-beet by counting the chloroplasts in the guard cells.]** *Züchter* 1958, **28**, No. 7, 309–14, bibl 3. [Zweigstelle Rosenhof, Max-Planck Inst. für Züchtungsforschung, Ladenburg a. N., W. Germany]

The Japanese method of counting the number of chloroplasts in the guard cells of the stomata of the leaf is the quickest way of distinguishing between diploid, triploid and polyploid sugar-beet. The present paper describes improved techniques for making chloroplasts more easily visible. These include introducing a wetting agent to the cuticle and, by using a solution of I_2 in KI, identifying the chloroplasts by means of their starch grains instead of darkening them with $AgNO_3$. The best technique was to examine the tissues under the fluorescence microscope, the chloroplasts exhibiting a red fluorescence when irradiated with blue light. By counting the number of chloroplasts in 10 pairs of guard cells on each specimen of leaf epidermis it is possible, on first examination of a mixture of plants, to identify 90% of them as diploids, triploids or polyploids. A further examination of the

remaining 10% decides the condition of another 6–7% of the total. The mean numbers of chloroplasts per guard cell for 2x, 3x, 4x and 5x plants were, respectively: 14, 20, 25 and 32. The identification is easily carried out.—D.B.

760 Fourré, Jeannine. Sur l'emploi de la méthode conductimétrique dans l'étude du gel des betteraves sucrières. [**The use of the conductimetric method in the study of frost on sugar-beets.**] *C.R. Acad. Sci., Paris* 1958, **247**, No. 7, 689–92, bibl. 1, illus.

This electrical method for determining the effect of cold on sugar-beet tissues was tested on stored diploid sugar-beets, which were subjected to cold. The electrical resistance of the roots decreased, the lower the temperature to which the roots were exposed.—E.B.O.

761 Fourré, Jeannine. Action du froid sur les tissus de betteraves sucrières. [**Effect of cold on sugar-beet tissues.**] *C.R. Acad. Sci., Paris* 1958, **247**, No. 3, 338–9.

The results from cytological observations on sugar-beets kept at temperatures between 0° and —16°C. showed that the various tissues of a single root have different resistances to low temperatures. —E.B.O.

FODDER-BEET

762† Josefsson, A. Sambandet mellan avkastning och olika antal dubbleplantor gallringsförsök foderrotfrukter. [**The relationship between yield and different frequencies of double plants in a thinning experiment with root crops.**] *Sverig. Utsädesfören. Tidskr.* 1958, **68**, No. 1–2, 33–44, illus., English summary.

The future of root-crop-growing in Sweden depends upon mechanization, and mechanization of the thinning process will probably entail an increase in the number of double plants in the field. A preliminary report is presented on experiments, begun in 1957, to study the effect of double plants upon yield. One mangel, 2 fodder-beet and 2 swede varieties were used. Double plants had only a small effect on dry-matter yields. Only in the deep-rooting fodder-beet Solid and possibly in Bangholm swede was there a decrease (not significant) in yield caused by double plants. The weight of each of the double roots averaged 60% of that of single roots; the dry-matter content was somewhat higher. The weight of single roots was distinctly lower in stands containing high frequencies of double roots. Differences between varieties in this respect were analogous to differences in the effect of double plants upon yield. Only in Barres mangels was there any marked effect of double plants upon the yield of tops. F. Eng. s.—G.M.R.

763† Meier, W. Sortenversuche mit Futterrüben. [**Varietal trials with fodder-beet.**] *Mitt. schweiz. Landw.* 1958, **6**, No. 2, 17–23, bibl. 3, illus. [Eidg. Landw. Versuchsanst., Zürich-Oerlikon]

Following 3-yr. trials at locations between 430 and 760 m.a.s.l., an account is given of 8 fodder-beet varieties imported into Switzerland. The best varieties were: for beet yields, Zentaur and Corona; for dry-matter yields [of roots], Hollandia and Zentaur; for yield of tops, Oetofte Gelbe and Pajbjerg; for resistance to bolting, Oetofte Gelbe and Barres Kostelecka. Zentaur was the most liable to bolt and Udyckie Polenkrowe the most susceptible to leaf spot [*Cercospora beticola*]. [See also *Herb. Abstr.* 26 : 747.]—D.B.

764† Thompson, F. B. **Weed control in Brassica and fodder beet crops.** *Proc. 11th N.Z. Weed Contr. Conf.* 1958, 68–73, bibl. 3. [Rukuhia Soil Res. Sta., Hamilton, N.Z.]

Post-emergence treatment of Brassica crops with sodium nitrate at 280 lb. per ac. gave slight, but unsatisfactory weed control. Crop responses to the N and increases in yield were slight. Post-emergence application of sodium mono-chloroacetate (monoxone) at 15 lb. per ac. gave good control of most broad-leaved weeds, but not of grass weeds. Kale, rape, and chou moellier were resistant, swedes slightly susceptible and soft turnips susceptible to monoxone and yields varied according to crop susceptibility. The possibility of post-emergence treatments superseding pre-emergence applications of TCA is discussed. Pre-sowing applications of TCA (20 lb./ac.) and CIPC (4 lb./ac.) gave good weed control in fodder beet. F. s.—M.H.

765† McAllister, J. S. V. and McConaghy, S. **Experiments with phosphatic fertilizers on fodder-beet.** *Res. exp. Rec. Minist. Agric. N. Ire. 1957*, 1958, **7**, 79–83, bibl. 4. [Hort. Centre, Loughgall, N. Ire.]

On soils of pH 5·8–6·2, Red Øtofte fodder-beet gave significant yield increases when 0·4–0·6 cwt. per ac. P_2O_5 as superphosphate, or 0·6 cwt. P_2O_5 as basic slag, was applied. Ground rock phosphate also increased yields, its efficiency being about 70% that of superphosphate.—A.M.H.

766 Bakermans, W. A. P. Onderzoek naar de factoren die rendabele bietenverbouw op onze zandgronden beperken. 3. Kalium-magnesiumproefvelden in 1951 en 1952. [**Research on factors limiting profitable beet-growing on Netherlands sandy soils. 3. Potassium and magnesium trial grounds in 1951 and 1952.**] *Versl. 6 Inst. Biol. Scheik. Onderz. LandbGew.* 1957, pp. 42, bibl. 6, mimeo.

Trials were made on the application of K and Mg to fodder-beet grown on light sandy soils in

1951 and 1952. K was given at the rate of (a) 100 and (b) 300 kg. K_2O per ha., either in January, or at sowing, and on most of the plots MgO was applied and compared with no Mg. No farmyard manure was used. Emergence, early development, freedom from disease and yield of the crops were governed in the main by the pH, the Mg-content and the water table of the plots, and only to a small extent by manurial treatment. The time at which K was applied made little difference to results. With sufficiently high K status of the soil (K number greater than 35), manuring did not produce higher yields. On the whole, 100 kg. K_2O per ha. at sowing was too little and 300 kg. probably too much. On plots with low pH and low Mg-content, an early application of 300 kg. K_2O per ha. gave the best results, while on the more fertile plots 300 kg. K_2O/ per ha. at sowing was best, but the differences were very slight. Low Mg contents and pH values in the soil resulted in considerable reductions in yield, which were offset to a significant, but only limited, extent by applying Mg. On soils with adequate Mg contents (>30 ppm. Mg) and satisfactory pH values, Mg applications had no appreciable effect on yields. There was no appreciable interaction between K and Mg. On the whole, root yields were increased by Mg and leaf yields by K. Leaf-yellowing in August and September was related to the Na-content of the leaves of the young plants, and, in addition to K, an adequate supply of Na is probably important. Damage can perhaps occur from too high a concentration of salts at the time of sowing, but this need not be feared. [See also *Fld Crop Abstr.* 10 : 173.] F. S.—G.M.R.

SWEDE-TURNIPS

767 National Institute of Agricultural Botany. **Varieties of swedes.** *Fmrs' Leafl. 7 N.I.A.B.* 1958, pp. 4.

Five major types of British swedes are briefly described. The leaflet deals with varieties of the Light Purple Skin group. Details of yields, dry-matter contents, neck length and top size are given for 15 varieties.—A.M.H.

768† Josefsson, A. Svalöfs Fenixbangholm stam 035—en ny kålrot. **Svalöf's Fenix Bangholm, strain 035, a new swede variety.** *Sverig. Utsädesforen. Tidskr.* 1958, **68**, No. 1–2, 52–60, illus., English summary.

The new swede variety, marketed in Sweden in 1958, will replace Svalöf's Bangholm 05. Its derivation, morphology, resistance to insect pests and mildew are detailed, and its performance compared with other varieties. In trials, the new strain has consistently outyielded the old 05 strain ; in dry-matter content (12%) it is not greatly superior to the old strain (11·9%) and in yield of tops approximately the same. The keeping quality in storage of the new strain appears to be as good as that of the old. F. Eng. S.—G.M.R.

769† Stenseth, C. Beising av kålrotfrø mot jordlopper. [**Treatment of swede seed to control flea beetle.**] *Norsk Landbr.* 1958, **77**, No. 9, 200–1, illus.

The results are given of trials in Norway in 1957 on the use of 3 insecticidal seed treatments for controlling flea beetle [*Phyllotreta* spp.] on swedes (var. Bangholm) and on the effect of such treatments on seed germination. The results indicated that dieldrin and lindane gave effective protection, with no adverse effects on seed germination.Recommended amounts of insecticide per kg. seed were : 100 g. 50% dieldrin powder, 45 g. 75% lindane powder and 70 g. 50% lindane powder. 10 ml. paraffin per kg. seed was suitable as a wetting agent.—P.J.B.

TURNIPS

770† Josefsson, A. Svalöfs Siriusrova. **Svalöf's Sirius turnip.** *Sverig. Utsädesfören. Tidskr.* 1958, **68**, No. 1–2 ,45–51, illus., English summary.

The results of trials since 1953 are reported and the performance and characters of Sirius compared with other varieties. Sirius has given good absolute and relative yields. In trials carried out by the Swedish Seed Association during 1948–56, Sirius gave 21% higher dry-matter yields (roots) than Svalöf's Bortfelder and 12% higher yields than Svalöf's Östersundom. In trials carried out in Jämtland by the State Agricultural Experiment Station during 1953–6, Sirius gave 23% higher dry-matter yields than Weibull's Tellus Bortfelder and 14% higher yields than Svalöf's Östersundom. Crude protein and sugar contents were 10·5% and 30–35% of the dry matter, respectively. Recommended spacings between plants in the row for Sirius are somewhat greater than for other varieties. [See also *Fld Crop Abstr.* 7 : 160.]—P.J.B.

771 Jameson, H. R. **The mechanism of the control of turnip flea beetle [*Phyllotreta* sp.] by benzene hexachloride dressings on *Brassicae* seed.** *J. Sci. Fd Agric.*1958, **9**, No. 9, 590–6, bibl. 7, illus. [Imp. Chem. Ind., Ltd., Jealott's Hill Res. Sta., Bracknell, Berks]

772 Moursi, M. A. and Maksoud, M. A. **The influence of fertilizers on root yield and vegetative growth of turnip.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 2, 221–5, bibl. 3. [Alexandria Univ. Agric. Exp. Fm, Egypt] [Received Nov., 1958]

Turnips [*Brassica rapa*] var. Sultani were sown in Sept., Oct. or Nov., 1954 and received 0, 75 or 150 kg. calcium nitrate and calcium superphos-

phate per feddan [1 feddan = 4594 sq. yd.] and 0, 50 or 100 kg. potassium sulphate per feddan. Root weight increased with increasing N and P and at later sowing dates. Application of K gave a slight, but not significant, increase in root weight. Foliage weight was increased by N, particularly in the first sowing. The shoot/root ratio decreased with decrease in the average temperature during the growth period.—A.M.H.

POTATOES

See also Abs. 896, 949, 1009, 1069

773 Ministry of Agriculture, Fisheries and Food, England and Wales. **Maincrop potatoes.** *Adv. Leafl. 470 Minist. Agric., Fish., Fd, England and Wales* 1958, pp. 5.

Information is given on: seed stocks; varieties; cultivation before and after planting; manuring; planting; lifting; storage; sorting; use as stock feed.—A.M.H.

774 Myhre, D. L. **Effects of breaking hardpan and deep plowing on potato yields.** *Proc. Soil and Crop Sci. Soc. Fla* 1957, **17**, 231–6, bibl. 4. [Potato Investigations Lab., Hastings, Florida] [Received Nov., 1958]

Breaking the organic hardpan under a Leon soil and incorporating it with the topsoil facilitated soil-moisture movement after irrigation by the furrow method, increased soil-moisture retention and provided additional nutrients for the potato crop. In 1956, the increased value of the crop exceeded the cost of land preparation. The beneficial results were greater in the first year after breaking the hardpan than in the second. Deep ploughing increased Red Pontiac yields by 9% and decreased Sebago yields by 4%. F. conclusion.—A.M.H.

775 Feddersen, H. D. **Results from potato trials at Echunga, 1957-58.** *J. Dep. Agric. S. Aust.* 1958, **62**, No. 2, 82–5, illus.

Once-grown seed gave a slightly higher total yield than certified seed. A plot planted with butt ends from certified seed yielded 9·25 tons/ac. compared with 14·4 tons/ac. from certified seed. Seed tubers weighing less than 1·75 oz., planted 9 in. apart in the row, yielded less than normal 2-oz. seed, and were not suitable for seed production because of the small number of stems produced. Normal round seed spaced 9 in. apart in the row yielded a greater proportion of small tubers than that spaced 12 in. apart. Whole 9- to 12-oz. tubers gave a large proportion of tubers below 3 oz. and yielded less than 2-oz. seed because the plants needed water earlier.—A.M.H.

776 Wilson, J. H. **Spray irrigation on potatoes and other field crops.** *J. Aust. Inst. agric. Sci.* 1958, **24**, No. 3, 210–13, bibl. 3.

The effects of irrigation on yield, tuber quality and production costs of potatoes grown in Tasmania are discussed.—A.M.H.

777 Departamento de Investigación Agropecuaria, Colombia. Investigación agricola en Tibaitatá. Sección de papa. [**Agricultural investigation at Tibaitatá. Potato section.**] *Bol. misc. 1 Dep. Invest. agropec.* 1958, pp. 25–36, illus.

In the work carried out in Colombia to obtain improved potato varieties resistant to *Phytophthora infestans*, the first positive results obtained were the hybrids 50–57–67 and 50–57–63, which are being multiplied. In trials to control *Ph. infestans* by chemical treatment in the field, manzate, dithane M.22 and orthocide 50 were best. Results from trials in the Sabana indicated that: (a) the best planting period for the varieties Tocana Blanca and Tuquerreña is 15 Jan.–15 Feb.; (b) the highest yield of ware tubers is obtained after 5 months from Tocana Blanca and after 5·5 months from Tuquerreña; (c) for production of seed potatoes, Tocana Blanca should be harvested after 4 months and Tuquerreña after 4·5 months. In trials to study spacing and size of seed tubers, the highest yields were obtained by planting at 30 cm. in furrows 90–100 cm. apart and by using tubers weighing approximately 60 g. each. Manzate and dithane M.22 were effective also for treating the cut surface of potato setts.—E.B.O.

778 Scholte Ubing, D. W. De invloed van de watervoorziening en de totale instraling op de opbrengst van aardappelen. **The influence of water supply and total global radiation upon the yield of potatoes.** *Landbouwk. Tijdschr., Wageningen* 1958, **70**, No. 6, 453-64, bibl. 8, English summary. [Lab. Physics and Meteorology, Wageningen]

Tuber yield and the total production of dry matter in potatoes increase with the total amount of the water supply, as long as this is less than the potential evapotranspiration. Every year, however, there are factors which affect this increase. The factors inhibiting production exercise a more or less constant influence during the growing season. Investigations show that during the growing season in the Netherlands, radiation can be one of the factors limiting production. In general, given the same water supply, higher yields result from greater radiation. Since a certain part of the radiant energy is absorbed by the soil, soil temperature should be of great importance for the growth and yield of the crop. F. Dutch s. —G.M.R.

779 Foreman, M. S. **Crop defoliation.** *Proc. 11th N.Z. Weed Contr. Conf.* 1958, 74–9, bibl. 1. [J. H. Barbour and Son Ltd., Wellington, N.Z.]

Various aspects of crop defoliation are dis-

cussed. Arsenical herbicides for defoliation of the potato plant have been widely used in recent years; 10–12 lb. of arsenic trioxide in 30–40 gal. water/ac. is considered a cheap and efficient defoliant if applied a few weeks before harvesting the crop. The susceptibility of potatoes to taint limits the use of endothal, dinoseb + dinosam, and PCP in all except the smallest quantities.—M.H.

780 Schulze, E. Folgewirkungen der Kartoffel-Vollernte. [**Consequences of using the mechanical potato harvester.**] *Z. Acker- u. PflBau* 1958, **105**, No. 4, 459–66, bibl. 3, illus., English summary.

An investigation was carried out during the autumn and winter of 1954, using the variety Bona, to determine whether riddling by the mechanical harvester, as opposed to using a potato digger followed by hand picking, resulted in any degree of visible or invisible damage, loss of dormancy, or sprouting of fresh tubers. The following results are noteworthy. Mechanical harvesting caused disproportionately greater damage to tubers than the digger followed by hand picking. Even during only 2·5 months' storage, the proportion of decaying and blighted tubers in the mechanical harvester test was so high that undamaged tubers had also become diseased. After digging and hand picking, the proportion of damaged and decayed tubers was small. Mechanically harvested tubers sprouted more readily and more vigorously than hand-picked ones ; the riddling process of the mechanical harvester breaks dormancy and so produces the conditions for early and rapid sprouting after harvest. These results need to be borne in mind in the further development of mechanical potato-harvesters. Ways and means must be devised at least to reduce the riddling processes to a minimum. Otherwise, by installing a mechanical harvester, additional losses have to be reckoned with during storage in either clamp or cellar. In cold storage, warehouses, pre-sprouting rooms, and potato barns for storing seed potatoes, where temperature, lighting and aeration can be controlled, losses, even of damaged potatoes, can be kept within manageable limits. The injuries can be ignored when harvesting potatoes for immediate use as fodder or for distilleries. F. s. —D.B.

781 Zaag, D. E. van der. Doorwas in aardappelen in 1957. [**Second growth in potatoes in 1957.**] *Landb Voorl.* 1958, **15**, No. 11, 588–99, bibl. 3, illus. [Proefsta. Akker- en Weidebouw, Wageningen, Netherlands]

In 1957, because of dry conditions in the early part of the growing season, followed by very wet weather, second growth occurred in many potato crops, especially on the heavier soils. Secondary tubers grew from the primary tubers in many varieties ; in varieties resistant to potato blight (*Phytophthora infestans*) the primary tubers acted only as channels for conveying nutrients to the secondary tubers, whereas in susceptible varieties the haulms did not supply sufficient nutrients so that the secondary tubers grew at the expense of the primary ones. In the latter case, the primary tubers became watery and rotted, causing damage to sound tubers when stored in clamps. In air-cooled potato-stores the watery tubers were able to dry before the sound tubers were affected. Many " glassy " potatoes were found in crops of Bintje and Eigenheimer, but none in Bevelander, even though there was a marked degree of second growth in this variety. Recommended methods for minimizing losses due to second growth were as follows : (a) where yields of varieties susceptible to blight are reasonably high when second growth occurs, the crop should be lifted immediately ; if yields are low, crops should be sprayed to control blight and allowed to grow further, but those on clay or sandy clay soils should be sprayed to kill the haulms, as soon as blight appears, and then lifted as soon as possible ; (b) leave resistant varieties until the tops begin to die naturally ; they should then be lifted immediately ; (c) tubers should be stored in ventilated buildings, if possible. With seed potatoes, long sprouts should be removed before storing.—R.B.

782 López, C. G. and Zubeldia, L. A. Estudio y descripción de variedades antiguas de patata cultivadas en España. [**A study and description of old potato varieties grown in Spain.**] *An. Inst. nac. Invest. agron.* 1958, **7**, No. 2, 263–331, bibl. 14, illus., English summary. [Esta. Mejora Patata, Vitoria, Spain]

The cultivation of the 19 potato varieties described started in Spain probably at the beginning of this century and, in some cases, much earlier. Choriza, one of them, is not now cultivated but grows wild in some areas of the Sierra de Cameros (Logroño). These varieties are generally well adapted to the Spanish climate but are now diseased and low-yielding.—E.B.O.

783 Sementi Elette. I risultati della sperimentazione collegiale sulla patata. [**The results from joint potato trials (in Italy).**] *Sementi elette* 1958, **4**, No. 4, 44–8, illus., English and German summaries.

In potato trials throughout Italy in 1951–7, the old-established, and also the most widely grown varieties Tonda di Berlino, Majestic and Bintje, gave the highest yields almost everywhere. Of the other varieties tested, only Ackersegen, Bona, Kennebec, San Michele and Solanum, gave comparable yields. It is concluded that : Tonda di Berlino and Solanum are suitable for every region ; Majestic also for every region but especially for mountain areas ; Bintje especially for the plains ;

Kennebec and Ackersegen especially for mountain areas ; Bona for every region but particularly for the plains ; San Michele especially for mountain areas and plains in northern Italy. Vera, Saskia and Sirtema are suitable for early cultivation, and Nova, Maritta, Panther and Benedikta are especially suitable for starch production. The most suitable varieties for production of healthy seed potatoes in Italy are Tonda di Berlino, Majestic, Bona, Kennebec, Sirtema, Saskia, Vera and Solanum.—E.B.O.

784 ORTMANN, C. Kritische Untersuchungen über die Wirkung verschieden vorbehandelten Kartoffelpflanzgutes auf Entwicklung und Ertrag. [**Critical examination of the effect of different treatments of seed potatoes on development and yield.**] *Z. landw. Vers. u. UntersuchWes.* 1957, **3**, No. 3, 211–23, bibl. 16, Russian and English summaries. [Inst. PflZücht., Bernburg, E. Germany]

A study was made of 4 preplanting treatments of seed potatoes on their early development and subsequent growth. The treatments were : (1) sprouting in the dark during storage ; (2) removal of sprouts formed in the dark ; (3) sprouting in light ; (4) subsequent exposure to light of sprouts formed in the dark. The varieties showed no common reaction to the different treatments during the first 2 yr. of the experiment, during which weather was normal for Central Germany. In the 3rd yr., when weather was particularly favourable to potato growing, there was a marked superiority in yield from those tubers which had experienced dark and light treatment. Taking the average of results of all treatments and all varieties from the years with typical weather, none of the treatments gave yields significantly higher than those obtained from treatment (1). F. Ger. s.—D.B.

785 GAGNON, L. P. Essais, en pré-émergence, de désherbage des pommes de terre par les herbicides. [**Pre-emergence weed control trials in potatoes.**] *Rep. Quebec Soc. Protect. Pl. 1957*, 1958, 76–8. [Div. Mauvaises Herbes, Minist. Agric., Québec]

Katahdin potatoes were given pre-emergence applications of (a) dinoseb at 3·6 lb./ac., (b) 3 lb. dinoseb + 2 lb. CMU [monuron]/ac., or (c) MCPA at 5 oz./ac. Treatment (a) gave almost complete weed control, leaving few annual grasses, while (b) resulted in almost complete kill of annual grasses. Treatment (c) killed 57% of broad-leaved weeds and potato yields from these plots were highest of all. More than 25% of the potato plants were killed by treatment (b), probably through insufficient mixing of the herbicides. Some plants in all plots bore tubers above ground, but in plots treated with MCPA aerial tubers occurred on more than 50% of the plants.—R.B.

786 BELL, R. S. and TIDDELL, T. F. **Pre-emergence and post-tillering weed control tests with potatoes.** *Proc. 12th N.E. Weed Contr. Conf.* [*USA*] 1958, 61–73.

In trials in Rhode Island in 1956, pre- or post-emergence treatment with diuron, monuron and neburon made it possible to dispense with up to 3 cultivations. In 1957, a very dry year, pre-emergence treatments resulted in yields substantially below those of cultivated controls. Post-tillering treatment with 3Y9 at 4 lb./ac., emid (2,4-dichlorophenoxyacetamide) at 2 lb. and sesone at 3 lb./ac. were effective against all weeds, especially grass spp.—P.J.B.

787 GUSTAFSSON, N. Blastdödning i potatis. [**Haulm destruction in potatoes.**] *Lantm. Svenskt Land* 1958, **69**, No. 31, 657–9, illus.

In 18 regional trials in Sweden during 1956–7, H_2SO_4 at 100 l./ha., klorex at 30 kg., and arsenol at 20 l. were each used for defoliating potato crops to protect the tubers against blight [*Phytophthora infestans*]. All treatments resulted in over 90% kill of leaves 7 days after application, compared with 26% dead leaves in untreated controls. The percentage of dead stalks was highest for H_2SO_4, with 34% at 7 days after treatment, compared with 2% for controls. There was evidence that spray volumes greater than 600 l./ha. were needed where the crop was very leafy. The percentage of blighted tubers averaged 8·4% for controls and 3·7, 5·1 and 4·6% following the H_2SO_4, klorex and arsenol treatments, respectively. The best effect was secured where between 5 and 20% of the crop was infected with blight. In further trials, the effect of haulm crushing, with or without defoliant treatment, was studied in 11 trials. The percentages of blighted tubers from crops : (a) untreated, (b) after haulm-crushing, (c) after H_2SO_4 treatment and (d) after haulm-crushing + H_2SO_4 treatment averaged 16, 15, 8 and 12, respectively.—P.J.B.

788 LINT, M. M. DE. Het doodspuiten van het loof bij pootaardappelen. [**Spray-killing of the tops in seed-potato cultures.**] *Meded. N.A.K.* 1958, **15**, No. 3, 30–1, illus. [Phytopath. Service, Wageningen]

Four years' experimental work on the chemical destruction of potato tops was discontinued in 1958, partly on account of advances in the development of mechanical haulm-pullers. Results are here summarized for the farmer. The aim of potato-top destruction is to break the contact between haulm and tuber and thus prevent virus infection of the latter. The safest ways of achieving this are by haulm-pulling or early lifting. The spraying alone of a vigorous crop gives inadequate results, but if preceded by mechanical treatment such as beating or harrowing, subsequent spray treatments can be successful. Spray should be applied at the rate of

800–1000 l./ha., and there should be 1–2 treatments for early varieties, applied in different directions and with 2–3 days between, or 2–3 treatments for late varieties. Of the means available, arsenite gives the best results. DNC in oil is somewhat less effective, and dinoseb or PCP in oil still less so. Tubers should be lifted as soon as their skin is sufficiently hardened, especially if infection by *Rhizoctonia* is likely, or if the haulms do not readily die back. [See also *Fld Crop Abstr.* 11 : 262.]—G.M.R.

789 Svensson, B. Matpotatisens kvalitet. 1. Litteraturöversikter. **The quality of table potatoes. 1. A review of the literature.** *Medd. 94 Stat. JordbrFörsök* 1958, pp. 38, bibl. in text, English summary.

The subject is reviewed in 3 parts. The first deals with potato scab, caused by *Streptomyces* spp., with sections on the systematics and physiology of *Streptomyces* spp., and the control of scab by disinfection of seed tubers and soil, altering the soil pH, and by biological methods, including the use of green manures, antagonistic microorganisms, and different rotations and manurial treatments. The second part deals with blackening of tubers, of which 2 types are distinguished : (a) blackening of raw tubers, caused by the oxidation of tyrosine to melanin and (b) the blackening of cooked tubers on exposure to the air, owing to the oxidation of Fe-polyphenol compounds. The relationship between different cultural and other factors and blackening is regarded as very complex. The third section deals with distance between rows, distance between plants in the row and different seed-tuber sizes. It is concluded that satisfactory yields can be obtained from the use of all but the smallest tubers, provided that plant spacing is adjusted to tuber size.—P.J.B.

790 Keller, E. R. Auswirkung von Säuberung und Neuaustrieben auf die Saatkartoffelqualität. [**The effect of (1) removal of haulms and (2) new shoots [from sprayed plants] on the quality of a seed-potato crop.**] *Mitt. schweiz. Landw.* 1958, **6,** No. 6, 87–90. [Eidg. Landw. Versuchsanst. Zürich-Oerlikon]

The effect was studied of (a) early-, (b) later- (by 10 days) and (c) non-removal of virus-infected haulms of potato plants on the health of tubers of neighbouring plants as judged by the percentage of diseased plants among their progeny. With leaf-roll infection, the time of removal of haulms had no marked effect on the health of seed potatoes of neighbouring plants so long as they were harvested before mid-July, but if harvesting was delayed even by a few days, the percentage of diseased plants among the progeny greatly increased. The data show that the usual date of harvesting in Central Switzerland (20 July) involves risk. Mosaic disease caused more damage to tubers of neighbouring healthy plants than did leaf-roll disease. In connexion with the destruction of potato tops by spraying, it is shown that infection can be spread from new aerial shoots, which develop later.—D.B.

791 Brouwer, W. and Reichert, R. Thermale Behandlung blattrollkranker Kartoffelknollen. [**Heat treatment of potato tubers infected with leaf roll disease.**] *Z. Acker- u. PflBau* 1958, **106,** No. 4, 475–6, bibl. 3. [Inst. PflZücht., Stuttgart-Hohenheim, W. Germany]

Following preliminary investigations it is stated that the leaf-roll virus of potato is inactivated in tubers which have been subjected to a temperature of 37°C. for 42 days.—D.B.

792 Abdel-Wahab, A. E. **Flowering and growth characteristics of the potato plant as influenced by the dark period interruption.** *Diss. Abstr.* 1958, **19,** No. 4, 621–2. [Louisiana State Univ., Baton Rouge]

793 Doorenbos, J. **Effect of gibberellic acid on sprouting of potatoes.** *Neth. J. agric. Sci.* 1958, **6,** No. 4, 267–70, bibl. 2. [Lab. TuinbPlTeelt, LandbHogesch., Wageningen, Netherlands]

Eyes of dormant tubers of 9 potato varieties were treated with GA. Only in the variety Rode Star was the period of dormancy appreciably reduced by treatment. The rate of sprout growth was hastened by GA in all varieties. GA applied to the lateral eyes of Gineke and Eigenheimer tubers caused more rapid sprouting of the apical eye. More lateral sprouts were produced by tubers treated with GA than by untreated controls.—R.B.

794 Scaramella Petri, Piera. Significato della forma e struttura nel *Solanum tuberosum* allevato a diverse altezze. [**Significance of shape and structure in *S. tuberosum* grown at different altitudes.**] *Genet. agr.* 1958, **9,** No. 4, 328–61, bibl. 88, illus., English summary. [Ist. bot., Univ. Bologna, Italy]

In an investigation to study the physiological senescence of potato tubers, those of the varieties Majestic and Tonda di Berlino, grown in Bologna province, were cut into 3 pieces, each of which was grown in 1956 at 3 altitudes in central Italy, viz. 400, 1100 and 1700 m.a.s.l. This procedure was continued in 1957 by planting pieces of the tubers produced in 1956 in the 3 localities. A relationship was found between leaf shape and the physiological age of the plant. While the leaves of plants grown at 400 m. evolved rapidly from a juvenile simple shape to an adult composite one, this change was slower in the plants grown at 1100 and 1700 m. in which the composite shape was present only in leaves growing from the higher nodes. The plants grown at 400 m., therefore, developed more rapidly

and were physiologically older than the plants grown at higher elevations. [See also *Fld Crop Abstr.* 10 : 1057.]—E.B.O.

795 Valle, E. **On anti-fungal factors in potato leaves.** *Acta chem. Scand.* 1957, **11**, No. 2, 395–7, bibl. 3. [Found. for Chem. Res., Biochemical Inst., Helsinki] [Received Nov., 1958]

The investigations reported relate to the chlorogenic-acid- and caffeic-acid-contents of potato leaves.—P.J.B.

796 National Institute of Agricultural Botany. **Stem-end blackening of potatoes.** *Rep. and Accts Nat. Inst. Agric. Bot. 1957*, Cambridge, [n.d.], p. 23. [Received July, 1958]

Discoloration is due to the formation of a complex between ortho-di-hydroxy phenols, probably chlorogenic acid, and iron. The intensity of discoloration depended on the concentration of these substances in the tuber, the pH, and the presence or absence of citrate ion competing with the phenols. Environmental differences tended to outweigh those between varieties. [See also *Fld Crop Abstr.* 11 : 1143.]—A.M.H.

797 Schuphan, W. Différences génétiques de qualité des protéines et de teneurs en amino-acides indispensables chez lez végétaux alimentaires. **[Differences in protein quality and in content of essential amino-acids among food-crop varieties.]** *Qual. Plant. et Materiae veg.* 1958, **3 – 4**, 34–44, German and English summaries. [Bundesanst. Qualitätsforschung pfl. Erzeugnisse, Geisenheim/ Rh., W. Germany]

Differences in protein composition between malting barley varieties were relatively small. The crude-protein content of potato varieties varied between 1·5 and 2·1%, on a fresh-weight basis, and the percentage of essential amino-acids in this protein ranged from 37 to 47 ; there was no correlation between protein content and essential amino-acid content.—R.B.

798 Schuphan, W. and Postel, W. Action de la fumure et du climat sur la teneur en amino-acides indispensables. **[The effect of manuring and of climate on essential amino-acid content.]** *Qual. Plant. et Materiae veg.* 1958, **3 – 4**, 45–60, German and English summaries. [Bundesanst. Qualitätsforschung pfl. Erzeugnisse, Geisenheim/Rh., W. Germany]

The addition of NPK to f.y.m. for manuring potatoes increased tuber yield and protein quality. Where more than 120 kg. N/ha. was applied with the f.y.m., tuber yields no longer increased, but there was a marked increase in crude-protein content and the percentage of essential amino-acids in the protein decreased. Climatic conditions influenced the crude-protein content of brewing barley ; increases in crude-protein content were associated with decreases in protein quality. F. s. —R.B.

799 Reith, J. W. S. and Inkson, R. H. E. **Effects of fertilizers and dung on potatoes.** *J. agric. Sci.* 1958, **51**, No. 2, 218–24, bibl. 12. [Macaulay Inst. for Soil Res., Aberdeen]

Field experiments were carried out on potatoes in N.E. Scotland to measure the responses to, and the 2-factor interactions between, N, P, K and dung. Responses to N, P and K varied from centre to centre, but all three gave moderately large mean increases. The mean responses to N and P were the same with or without dung, but the response to K was reduced by two-thirds in the presence of dung. The response to each nutrient tended to increase in the presence of the other two. N and K showed practically no interaction effects. In the absence of fertilizers, dung produced a considerably larger increase in yield than in their presence. The N and K contents of the tubers were appreciably increased by the N and K treatments, respectively. The K content was also increased by dung. Suitable fertilizer dressings are suggested for potatoes grown with or without dung. F. s.—A.M.H.

800 McAllister, J. S. V. and others. **Effects of varying the levels of fertilizers applied to the potato crop in Northern Ireland.** *Res. exp. Rec. Minist. Agric. N. Ire. 1957*, 1958, **7**, 84–101, bibl. 7. [Agric. Res. Inst. N. Ire., Hillsborough, Co. Down]

Experiments are described in which fertilizers of different NPK ratios were applied at different rates to potatoes in Northern Ireland. The results are presented in 3 sections, dealing respectively with yields, quality and the fertilizer residues remaining in the soil after harvest. In the presence of farmyard manure, there was little or no response to sulphate of ammonia or muriate of potash at rates above 1 cwt./ac. and no response to levels above 1·5 cwt./ac. In the absence of f.y.m., there was no response to sulphate of ammonia at rates above 2 cwt./ac. and only a small response to 2 cwt. muriate of potash/ac., even on K-deficient soils. There was no response to P at levels above 6 cwt. superphosphate/ac. High rates of N or K (over 4 cwt. sulphate of ammonia or muriate of potash/ac.) reduced plant numbers, particularly in dry seasons, or when cut setts were used. There was no significant reduction in plant numbers at P levels up to 10 cwt. superphosphate/ac. Keeping quality was not significantly affected by fertilizer treatments, but sulphate of ammonia at 4 cwt./ac., or muriate of potash at 4 cwt./ac., in the presence of sulphate of ammonia, adversely affected cooking quality. F. s.—A.M.H.

801 Franc de Ferrière, P. J. J. and others. Influence des types d'argile des sols et de la

pluviosité sur la nutrition potassique de la pomme de terre. [**Influence of type of soil-clay and rainfall on the K nutrition of the potato.**] *Ann. agron., Paris* 1958, **9**, No. 1, 51–70, English, German and Russian summaries. [Soc. Com. Potasses d'Alsace, Mulhouse, France]

This is a study of the relationship between type of soil clay in 9 field trials and the yield of potatoes obtained with different doses of K fertilizers, in relation to rainfall in different years. Results indicated that the K requirement of a potato crop depends not only on the physiological requirement of the plant but also on the K^+-ion requirement of the clay, which varies with its mineralogical character and increases as its cation-exchange capacity increases. The application of humus to the soil (organic amendments or green manures), which increases the capacity of the soil to hold K^+-ions and rain water, always benefits potato yields. F. s. —E.B.O.

802 PRUMMEL, J. Genezing van kaligebrek bij aardappelen door bespuiting of overbemesting in een laat stadium. [**Control of potassium deficiency in potatoes by spraying or topdressing at a late stage of development.**] *LandbVoorl.* 1958, **15**, No. 5, 237–41, bibl. 4. [Inst. Soil Fertility, Groningen]

Recovery from serious drought-induced K-deficiency in potatoes was visible within a week after top-dressing or spraying with K fertilizer. The increase in yield obtained on one of the trial plots amounted to 35%. Spraying with 60–90 kg. K_2O per ha. gave a higher yield than approximately the same amount applied to the ground. KCl used as a spray caused somewhat more burning than did K_2SO_4 and a somewhat greater reduction in sp. gr. Spraying or top-dressing with K can be done late in the season, especially to potatoes ready for lifting. —G.M.R.

803 WACHTEL, T. **Fertilizer trial with potatoes, Manjimup 1957-58.** *J. Dep. Agric. W. Aust.* 1958, **7**, No. 5, 563–8, illus.

In a trial on typical karri loam soil, increasing the rate of ammonium sulphate from 3 to 6 cwt./ac. gave a significant yield increase. There was no further increase when the rate was raised to 9 cwt./ac. Responses to superphosphate were significant up to the level of 12 cwt./ac. Increasing the rate to 24 cwt./ac. resulted in a slight, but not significant, yield increase; 32 cwt./ac. gave no further increase. Increasing the rate of muriate of potash from 1 to 2 cwt./ac. had no effect on yield, but a further increase to 4 cwt./ac. increased yield slightly. Increasing the level of N and P decreased the proportion of tubers with high specific gravity; increasing P gave a higher proportion of starchy tubers.—A.M.H.

804 MORENO, M. U. and CALZADA, B. J. Estudio comparativo entre abonamientos nitrogenados sobre el cultivo de papas en la Sierra : zona de Huasahuasi. [**Comparative study on N fertilizers applied to potatoes in the Sierra of Peru : Huasahuasi zone.**] *Agronomía, Lima* 1958, **25**, No. 92, 59–70. [Esc. Nac. Agric., La Molina, Peru]

The results from the trial described indicated that at Huasahuasi, 3400 m.a.s.l., the best manuring for potatoes under natural rainfall conditions, was : farmyard manure 5000 kg./ha. applied to the fallow, guano 80 kg. N/ha. at planting, and potassium nitrate 40 kg. N/ha. when earthing-up the plants.—E.B.O.

805 SIMONS, D. Entstehung und Beurteilung von mechanischen Beschädigungen an Kartoffelknollen durch Erntemaschinen. **Origin and critical examination of mechanical injuries to potato tubers by various types of harvesters.** *Eur. Potato J.* 1958, **1**, No. 3, 41–7, bibl. 2, Fr. and Eng. summaries. [Inst. Landmaschinenforsch., Braunschweig-Völkenrode, W. Germany]

806 GALL, H. Fragen zur Einlagerung von Kartoffeln. [**Potato-storage problems.**] *Dtsch. Landw.* 1958, **9**, No. 10, 473–8, bibl. 8, illus.

This review article summarizes the influence of temperature, relative humidity of the air, ventilation and light on stored potatoes (seed and ware). Types of storehouse are described and costs of using each type are tabulated.—D.B.

807 WARLEY, T. and BARON, D. **A study of potato pre-packing costs.** *Univ. Nottingham Sch. Agric., Dep. Agric. Econ., Sutton Bonington, Loughborough*, 1958, pp. 24.

SWEET-POTATOES

See also Abs. 969.

808 KODAMA, T. and others. **Studies on the growth and yield of sweet potato plant sown directly under different cultural conditions. 1. On the growth and yield under different water contents of soil. 2. On the growth and yield under different kinds of soil and elevation.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 3, 225–7, English summary. [Kanto-Tosan Agric. Exp. Sta.]

809 HIRAI, G. **Relation between transpiration and distribution of sweet potato varieties.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26**, No. 4, 252–4, bibl. 10, illus., English summary. [Osaka Univ.]

In varieties of *Ipomoea batatas* cultivated in eastern Japan (Norin No. 1 and Okinawa No. 100), transpiration increased at 24–26°C. and decreased at 27–28°C. In varieties cultivated in southwestern Japan (Norin No. 2, Gokoku and Schichi-

fuku) transpiration increased at 27–28°C. and decreased at 24–26°C. F. Eng. s.—D.B.

810 STINO, K. R. and others. **Effect of fertilizers on the yield, vegetative growth and carbohydrate contents of sweetpotatoes.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 177–96, bibl. 17. [Coll. Agric., Shebin El Kom, Egypt] [Received Nov., 1958]

Three fertilizer experiments were carried out using the local sweet-potato var. Eskandarani and the American vars. Wennop and B.52. In the presence of 25 kg. sodium nitrate and 100 kg. calcium superphosphate per feddan (1 feddan = 4594 sq. yd.), tuber yields increased as amounts of muriate of potash applied increased up to 75 kg./feddan. Eskandarani gave the largest % increase. Muriate of potash had no significant effect on vine growth. N and P also gave small yield increases, the optimum levels of application being 25–50 kg. sodium nitrate/feddan and 100–150 kg. superphosphate/feddan. Both N and P also increased vine growth. None of the fertilizer treatments used had any effect on the carbohydrate contents of tubers of B.52 or Eskandarani.—A.M.H.

811 LIEBERMANN, M. and others. **Biochemical studies of chilling injury in sweetpotatoes.** *Pl. Physiol.* 1958, **33**, No. 5, 307–11, bibl. 19. [U.S. Dep. Agric., Beltsville, Maryland]

Leakage of ions from tissue slices, mitochondrial activity and content of ascorbic and chlorogenic acids were compared in sweet-potatoes stored at 15 and 7·5°C.—A.M.H.

812 NAKA, J. and TAMAKI, K. **Studies on the physiological nature of sweet potato plants. 10. On the physiological differences between the root tubers of varied developmental stages.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **27**, No. 1, 95–6, bibl. 11, English summary. [Kagawa Univ.]

Using the variety Okinawa No. 100 of *Ipomoea batatas*, some physiological differences in the fibrous, pencil-like [long sub-lateral ?] and tuberous roots were studied at a late stage of growth. Phosphorylase and phosphatase activities were lowest in the fibrous and highest in the tuberous roots, and there was a tendency for these activities to be increased in the tuberous roots as they thickened. Amylase activity was least in the fibrous roots and greatest in the pencil-like roots and was negatively correlated with thickness in the tuberous roots. The total ascorbic-acid content and total sugar and starch content were lowest in the fibrous roots and highest in the tuberous roots. Total sugar decreased and starch increased in the tuberous roots as they increased in thickness. F. Eng. s.—D.B.

CASSAVA

813 NORMANHA, E. S. Sistemas de plantio da mandioca. [**Methods for planting cassava.**] *Agronômico, Campinas* 1958, **10**, No. 5–6, 3.

Two methods for planting cassava, suitable for São Paulo, Brazil, are described. The usual method consists in opening furrows 10 cm. deep, in which cuttings 20–25 cm. long are placed horizontally in the direction of the furrows, and then covering with earth. In the second method, which requires more labour but gives higher yields than the former, cuttings 30 cm. long are thrust for half their length and at an angle of 45° into prepared loose soil. —E.B.O.

YAMS

814 NAKANISHI, H. and NEGURA, Y. [**Productivity of (a) pieces of tubers of Chinese yam in relation to their position on the tuber from which they were cut, and (b) of whole tubers raised from aerial tubers in relation to their size, for early harvesting.**] [Japanese] *J. Hort. Assoc. Japan* 1958, **27**, No. 2, 120–4, bibl. 7, illus., English summary.

Of the pieces of tuber [*Dioscorea esculenta*], each weighing 56 g., cut from a whole tuber, those from the stem end germinated earlier, made more vigorous early-growth of vines and produced higher early-yields [of new tubers] than pieces cut from lower parts. The productivity of whole tubers of different sizes (37–150 g.) was investigated. Within this range, the larger the size of tuber the greater was the yield of early tubers (in mid-August). To obtain tubers of 750 g. or more by mid-August, the planting of whole seed-tubers of 112–150 g. is recommended.—D.B.

COCOYAMS

815 HASHAD, M. N. and others. **Transformation and translocation of carbohydrates in taro plants during growth.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 261–7, bibl. 13. [Fac. Agric., Ain Shams Univ. and Fac. Agric., Cairo Univ., Egypt] [Received Nov., 1958]

Carbohydrate metabolism was studied in 2 varieties of taro, *Colocasia esculenta* vars. Baladi and Amrecani. Young plants contained more reducing- than non-reducing-sugars, but the reverse was true as the plants matured. The leaves of Baladi contained larger amounts of sugars than those of Amrecani ; translocation of sugars was faster in the latter variety. There were no morphological changes indicating maturity, but physiological maturity, i.e. the stage when the amount of total sugars in the corms is at a minimum, was reached at 30 weeks in Baladi and at 28 weeks in Amrecani. —A.M.H.

816 HASHAD, M. N. and others. **Transforma-**

tion of carbohydrates in taro corms during storage. *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 269–76, bibl. 12. [Fac. Agric., Ain Shams Univ., Cairo and Fac. Agric., Cairo Univ., Egypt] [Received Nov., 1958]

[See previous abs.] Changes in carbohydrate content of corms of *Colocasia esculenta* vars. Baladi and Amrecani were investigated under various storage conditions. Underground storage was suitable for periods up to 15 weeks. Of the methods used, cold storage at 7·2°C. was the only one suitable for storage periods of more than 15 weeks. Storage at room temperature (15–23°C.) was not satisfactory for longer than 10 weeks.—A.M.H.

817 HODNETT, G. E. **A fertilizer experiment on dasheen.** *Trop. Agric., Trin.* 1958, **35**, No. 3, 205–7, bibl. 4. [Reg. Res. Centre, Imp. Coll. Trop. Agric., Trinidad and Tobago]

The results are given of an exploratory factorial trial on dasheen (*Colocasia esculenta*) to test N, P, K, farmyard manure and 2 kinds of propagating materials (tops and suckers). Responses to N, P and f.y.m. were observed in the case of suckers, but the only appreciable response of the tops was to N. There was some indication of other interactions, notably between N and f.y.m. F. s.—A.M.H.

KALE

See also Abs. 1010

818 CREHU, G. DU. Le chou fourrager. Étude biologique. Problèmes variétaux. [**Kale. Biological study. Varietal problems.**] *Ann. Amélior. Pl., Paris* 1957, **7**, No. 3, 313–36, bibl. 10, English, Russian and German summaries. [Sta. Amélior. Pl., Rennes, France]

The kales (*Brassica oleracea* var. *acephala*) grown in France are derived from 3 basic types which show clear morphological and physiological differences from one another. These types are: Moëllier, Cavalier and Branchu. The most productive varieties were the least hardy and varietal choice for a particular climate must be dictated by the method and date of harvest. The traditional sowing method is to sow in nurseries and to transplant at a wide spacing; the new method of direct sowing, with high plant densities, shows promise.—E.B.O.

ROOT CROPS—GENERAL

819† KOFOED, A. D. Roernes opbevaring. [**The storage of root crops.**] *Dansk Landbr.* 1958, **77**, No. 10, 289–90, illus.

Practical considerations which should be taken into account when storing fodder roots and when constructing root storage-houses and clamps are discussed. The importance of not lifting root crops too early is stressed.—P.J.B.

FIBRE CROPS

COTTON

See also Abs. 890, 895, 937, 1048

820 MANNING, H. L. and KIBUKAMUSOKE, D. E. B. **The cotton crop.** *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 3–9. [Cott. Res. Sta., Namulonge]

1. Productivity and cotton crop estimates, pp. 3–8. In spite of a successful campaign for early sowing in areas growing BP52 strains, where the mean sowing date was 23 June, yields were lower than expected because of low rainfall in Sept.-Oct. The estimated effect of early sowing on production in the Mengo-Entebbe area and the discrepancy between estimated and actual production are discussed.

2. Analysis of the effects of seed dressing and new seed, pp. 8–9. Over the period 1950–8, the average yield increase due to introduction of the variety S47 was 42% of the average yield in 1946–50 and the increase due to the effect of bactericidal seed dressing against *Xanthomonas malvacearum* was 9%.—A.M.H.

821 LEA, J. D. and PASSMORE, R. G. **Agronomy. Experimental work.** *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 20–1. [Cott. Res. Sta., Namulonge]

Cotton yields were higher on new land opened from elephant grass [*Pennisetum purpureum*] than after a *Chloris* ley, and higher in both cases than after 2 or more years' cropping. The effect of the grass ley generally persisted for 1 yr. only and was less apparent in years with good rainfall.—A.M.H.

822 LE MARE, P. H. **Soil science. [Effect of irrigation, spacing, nitrogen and phosphorus on cotton.]** *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 34–7. [Cott. Res. Sta., Namulonge]

A factorial experiment was carried out which included irrigation treatments, 3 spacings and 4 fertilizer treatments (no fertilizer, N and/or P). The mean yield of all treatments receiving rainfall, only, was 481 lb. seed cotton/ac. A total of 10 in. of water applied during the season increased yield by 570 lb./ac. and a total of 15 in. gave a further 120 lb./ac. yield increase. The effect of spacing depended on the irrigation treatment. With rainfall only, there were no significant differences between spacings. At the lower rate of supplementary water, 12-in. spacing within the row (3 ft. between rows throughout) was superior to 6-in. or 24-in. spacings. At the higher rate of irrigation, 6- and 12-in. spacings gave similar yields and were both superior to 24-in. In the absence of irrigation, N (100 lb./ac. as ammonium sulphate) decreased yield by about 100 lb. seed cotton/ac., while with irrigation it increased yield by 168 lb./ac. The

effect of P (50 lb./ac. as triple superphosphate) was small. The fertilizer effects were greatest at the 12-in. spacing.—A.M.H.

823 Walton, P. D. **Cotton breeding at Serere.** *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 61–5. [Serere, Eastern Province, Uganda]

1. Agronomy trial, pp. 61–4. Cotton sown in April or May yielded about twice as much as that sown in July. Albar outyielded S47, but the difference was significant from the 2nd sowing only. The yield of 8MB, a BP 52 strain, was intermediate at the first 2 sowings and similar to that of Albar at the late sowing. Albar was less susceptible to bacterial blight than the other 2 varieties.

2. Ridging trials, pp. 64–5. Single-cropping (bare fallow followed by cotton) gave higher cotton yields than double-cropping (early sorghum followed by cotton), but the difference was significant in one trial only. Flat cultivation outyielded ridge cultivation in 4 out of 8 trials.—A.M.H.

824 McKinstry, A. H. **Gatooma Research Station. Agronomy [cotton].** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1957*, Salisbury, 1958, 66–8.

In a factorial spacing and fertilizer trial at Gatooma, there were significant yield increases due to P (30–60 lb. P_2O_5/ac.) and K (30–60 lb. K_2O/ac.). Spacing at $3{\cdot}5 \times 0{\cdot}5$ ft. gave the highest mean yield (1125 lb. seed cotton/ac.) and was significantly superior to $3{\cdot}5 \times 1$ ft. and $3{\cdot}5 \times 1{\cdot}5$ ft. spacings. The interaction between N and the other factors, particularly P, was significant. Spacing was the principal factor influencing the number of fruiting points produced. More fruiting points per plant were present at the wider spacing, e.g. 116 at the 18-in. within-row spacing and 54 at the 6-in. spacing, but there were more fruiting points per unit area at the closer spacing, e.g. 309/10 sq. ft. at the 6-in. spacing and 221/10 sq. ft. at the 18-in. spacing. A fertilizer and spacing trial at Mondora showed significant responses to N and P, but not to K or to differences in spacing.—A.M.H.

825 Brown, C. H. **Cotton in British Guiana.** 1957, pp. 25, bibl. 5, mimeo. [Dep. Agric., British Guiana]

The history of cotton-growing in British Guiana is reviewed. An account is given of trials carried out in 1955–7 to investigate the possibility of the commercial production of cotton in the colony. On the heavy coastal clays, sowing on ridges was essential and the necessity for permanent 4-ft. drains hampered soil preparation. Some of the pegasse (acid peat) soils gave yields of up to 1074 lb. seed cotton/ac. when treated with 2–4 tons ground limestone per ac. A high rate of liming would probably be uneconomic because limestone has to be imported. The sand-reef soils were the most suitable for cotton-growing. Climatic conditions allow the cultivation of 2 crops of cotton per year, sown in early May or early November for harvesting in the autumn or spring dry-seasons. The autumn dry-season is more reliable, hence the autumn-harvested crop would be more suitable under estate conditions, but the spring-harvested crop is less attacked by stainers (*Dysdercus* sp.) and both crops would be suitable for peasant cultivation. Ratooning the plants gave good second crops and had the advantages of lengthening the ripening period of the initial crop and avoiding the costs of uprooting the plants and preparing the ground. Blackarm-resistant varieties from the Sudan proved the most successful of those imported, but the need for breeding to suit local conditions is emphasized. Yields which should be obtainable with adequate manuring and pest control are estimated at 800 lb. seed cotton/ac. from an annual crop, or 1000 lb./ac. from a ratoon crop. Estimates of production costs are made and the limits of their validity discussed. Reduction in the costs of picking and weeding would be essential. The quality of various cotton varieties when grown in British Guiana did not differ from that obtained in their countries of origin. Suggestions are made for the organization of a peasant cotton-growing scheme. It is not thought that cotton could fit into the rotation on the sugar estates because of the timing of labour requirements and the widespread use of 2,4-D, which is highly toxic to cotton.—A.M.H.

826 Šin-Cin, and others. [**An investigation on the date of topping cotton plants.**] [Chinese] *Acta Agric. sinica* 1958, **9**, No. 2, 177–81, illus., Russian summary.

A 2-yr. study on this subject has shown that topping should be done when the first flowers on 5–10 fertile branches are in bloom. F. Russ. s.—M.H.

827 Niles, G. A. and others. **Performance of cotton varieties in Texas, 1954-56.** *Bull. 877 Texas Agric. Exp. Sta.* 1957, pp. 14, maps 1.

828 Ashour, W. A. **Effect of sulphuric acid, fernasan and combined treatments on emergence of cotton seeds.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1957, **2**, No. 1, 251–4, bibl. 8. [Fac. Agric., Ain Shams Univ., Cairo, Egypt] [Received Nov., 1958]

With Giza 30, fernasan used at 0·25% of the seed weight gave the largest number of healthy seedlings, and seed immersed in concentrated H_2SO_4 for 4 min. gave fewer healthy seedlings than the control. The combined fernasan + H_2SO_4 treatment gave results intermediate between the control and the fernasan treatment.—A.M.H.

829 Ashour, W. A. **Effect of watering treatment, seed treatment and date of sow-**

ing on emergence and damping-off of cotton seeds. *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 2, 161–74, bibl. 10. [Fac. Agric., Ain Shams Univ., Cairo, Egypt] [Received Nov., 1958]

Seed dressing with fernasan at 0·5 [%] of seed weight increased germination of cotton seed in petri dishes from 90% in the control to 100%. Other fungicides used gave intermediate results. Spergon and fernasan at 1% of the seed weight significantly increased % survival of seedlings in soil, but had no significant effect on post-emergence damping-off. The % healthy survivals was greater from a heavy seed rate (30 holes/4-m. row ; 14 seeds/hole) than from the ordinary seed rate (20 holes/4-m. rows ; 7 seeds/hole), especially when 1% fernasan was used as a seed dressing. The beneficial effect of seed treatment was significant at all sowing dates except the one in May. The highest incidence of damping-off was from the December sowing.—A.M.H.

830 Bronckers, F. Recherches sur la conservation des semences de coton. [**Investigations on the storage of cotton seeds.**] *Bull. agric. Congo belge* 1958, **49**, No. 4, 923–33, bibl. 12, Flemish summary. [Lab. Phytotech. Trop., Univ. Louvain, Belgium]

From trials carried out in1955–6 it is concluded that sound cotton seeds, with a moisture content reduced to, and maintained at, 10% have a good germinating capacity after 6 months' storage. Sealed polythene bags are very practical for storing seed intended for distribution to growers.—E.B.O.

831 Wickens, G. M. **Plant pathology. Bacterial blight [of cotton] (*Xanthomonas malvacearum*).** *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 43–8. [Cott. Res. Sta., Namulonge]

Organo-mercurial seed dressings gave the greatest reduction in primary infection. Cotyledon infection was generally greater in machine-delinted than in fully-fuzzed seed, under all treatments. Albar 49 and A56/2 were highly resistant.—A.M.H.

832 Joyce, R. J. V. **Effect of the cotton plant in the Sudan Gezira on certain leaf-feeding insect pests.** *Nature, Lond.* 1958, **182**, No. 4647, 1463–4, bibl. 8. [Desert Locust Survey, Nairobi]

In this region *Gossypium barbadense* is attacked by jassids (*Empoasca libyca*), whitefly (*Bemisia tabaci*) and thrips (*Hercothrips fumipennis*), the intensity of attack varying from season to season. One cause of this variation was elucidated by studying the effect on the pests of nitrogenous fertilizer applied to the cotton. The seasonal incidence of the pests was correlated with pre-sowing rains and concentration of leaf-N. The data do not indicate that rains control leaf-N directly, but do so through other correlated factors influencing the early rate of development of the cotton plant. It is anticipated that, by study of the relevant facts, outbreaks of pests can be predicted before the crop is sown.—M.H.

833 Bowden, J. and Ingram, W. R. **Spraying trials on peasant cotton in Uganda in 1957.** *Emp. Cott. Gr. Rev.* 1958, **35**, No. 4, 239–43, bibl. 3. [Dep. Agric., Uganda]

Significant yield increases resulted from spraying S47 cotton in Uganda with 4 applications of 1 lb. DDT/ac. (as a 25% miscible liquid) at 10-day intervals. Economic returns accrued only from cotton sown early (May to mid-June). Results from spraying BP52 cotton in Bunyoro were less conclusive, but returns may be economic. Data from unsprayed plots confirmed the linear relationship between sowing date and yield ; later sowings gave lower yields. F. s.—A.M.H.

834 Bowden, J. and Ingram, W. R. **A revised interpretation of the causes of loss of crops of cotton in the drier regions of Uganda.** *Nature, Lond.* 1958, **182**, No. 4651, 1750, bibl. 2. [Sect. Entomol., Dep. Agric., Uganda]

Recent research at Serere has suggested that *Earias* spp. are responsible for considerable damage to cotton growing in the drier areas of E. Uganda and that this species is a more important pest than *Lygus vosseleri*. Spraying with DDT [see *Emp. Cott. Gr. Rev.* 1958, 35, p. 239] originally advised for the control of *Lygus* gives adequate protection against *Earias*.—C.L.S.

835 Coaker, T. H. **Entomology. Crop loss studies.** *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 38–42. [Cott. Res. Sta., Namulonge]

In a trial on the effects of treatments with a DDT/toxaphene mixture at various levels of soil moisture, there were no significant differences resulting from the insecticidal treatments, but the number of fruiting points shed was greater in the plants under supplementary irrigation than in the rain-grown plants.—A.M.H.

836 McKinstry, A. H. **Gatooma Research Station. Cotton insect pests control.** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1957*, Salisbury, 1958, 64–6.

Three endrin treatments, each consisting of 8 applications of 0·25 lb. active ingredient in 10 gal. water/ac., gave a mean yield of 795 lb. seed cotton/ac. Two treatments of 8 weekly applications of 10–12 lb. 10% DDT + 3% γ BHC dust per ac. yielded 445 lb./ac. and the untreated control yielded 310 lb./ac. Yields from plots which received a total of 13 weekly applications of endrin at 0·25–0·5 lb. in 10–20 gal. water/ac. did not differ

significantly among themselves, but were all significantly greater than that from a plot which received 5 weekly applications of 0·25 lb. endrin in 10 gal. water/ac. The treated plants showed a significant increase in the number of fruiting points produced and a reduction in the number of flower buds shed. Damage to large bolls was not appreciably reduced by endrin applied at 8 weekly intervals from first buds, but was reduced by later treatments.—A.M.H.

837 Adkisson, P. L. **Seed treatment of cotton with systemic insecticides alone and in combination with a fungicidal treatment.** *J. econ. Ent.* 1958, **51**, No. 5, 697–700, bibl. 6. [Univ. Missouri, Columbia]

Experiments were conducted with Delfos 9169 cotton-seed treated with thimet or Bayer 19639 and sown under cool, damp conditions in April, with or without in-furrow applications of nabam. Control seed was treated with ceresan. Some plots were sprayed with toxaphene to control insects. Seed treatments with insecticides resulted in effective thrips control until mid-June and some aphid control until mid-August. Bayer 19639 gave better aphid control than did thimet. There were serious reductions in stand, partly on plots sown with seed treated with either insecticide. Better stands and reduced phytotoxicity was observed in plots treated with insecticides plus nabam. The maturation of the plants was delayed considerably in all plots treated with systemic insecticides. No increases in yield occurred in plots treated with systemic insecticides or toxaphene spray. Seed of Deltapine 15 cotton treated with thimet and sown at the end of May showed no reduction in germination, and the stand reductions observed were entirely due to the lowered rate of seed flow in the drill resulting from the seed treatment.—R.B.

838 Early, J. D. **The control of boll weevils and mites in relation to the absorption and distribution of a systemic insecticide (thimet) in the cotton plant.** *Diss. Abstr.* 1958, **19**, No. 1, 193–4. [N. Carolina State Coll., Chapel Hill]

In glasshouse and laboratory trials, there was no significant difference between the germination of cotton seed treated with thimet and untreated seed. At 8 weeks after sowing in a glasshouse, seedlings from seed treated with thimet were taller than those from untreated seed ; in laboratory trials, the opposite was, in general, the case. In the glasshouse, thimet treatment resulted in leaf injury 6 weeks after sowing ; in the laboratory trials, almost no leaf injury was noted. Observations are made on the absorption, translocation and accumulation of thimet by cotton plants.—P.J.B.

839 Passlow, T. **Control of insects in cotton in Central Queensland.** *Qd agric. J.* 1958, **84**, No. 9, 557–60.

The main insect pests of cotton in Queensland are briefly described. Seedling pests, of which cutworms (*Euxoa radians* and *Agrotis infusa*) are the most damaging, can be controlled with 0·5 lb. DDT in 15 gal. water/ac. The normal routine for controlling *Heliothis armigera* is to spray with 0·2% DDT emulsion in 25–50 gal. water/ac. 2 weeks after germination, at the first major burst of squaring, which is normally 3–4 weeks after the first squares appear, and 3 weeks after this. Boll pests are of minor importance under Queensland conditions. The foliage pests likely to be of importance are jassids (*Austroasca terrae-reginae* and *A. viridigrisea*), which can be controlled by spraying with 1 lb. DDT in 15 gal. water/ac., and loopers (*Anomis flava* and *Antarchaea chionosticta*), which are controlled by spraying with 0·5 lb. endrin in 15 gal. water/ac. Trials indicated that spraying is likely to increase total yields in poor or late-sown crops only.—A.M.H.

840 Bhat, N. R. and Patel, C. T. **A study of the sympodial habit in an interspecific cross in *Gossypium*.** *J. Indian bot. Soc.* 1957, **36**, No. 4, 523–34, bibl. 2. [Agric. Res. Sta. Surat, Bombay State, India]

The cross was between *Gossypium herbaceum* and *G. anomalum*. Morphological data are presented.—E.B.O.

841 Farbrother, H. G. **Plant physiology. Growth analysis and soil moisture.** *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 21–32. [Cott. Res. Sta., Namulonge]

In a growth analysis of developing cotton plants, it was concluded that : (a) the main factor responsible for the lower yields from late-sown cotton was a less favourable moisture regime ; (b) there was a critical stage of development, after which a period of water stress checked further production of fruiting-points ; (c) the severity of this check was related to the number of bolls set at the time ; (d) the check to continued exponential growth in leaf area, which occurred between 10 and 18 weeks after sowing, was due to water stress in all cases. Subsequent growth analyses were conducted on crops with and without supplementary irrigation. The evaluation of amounts of rainfall or irrigation water received in terms of subsequent soil-moisture availability to plants was studied. [See also Abs. 844 and *Fld Crop Abstr.* 10 : 336.] Data are given on the calibration of nylon resistance units and on the relation between soil-moisture values obtained from plain and plaster-coated nylon units in the presence and absence of ammonium sulphate.—A.M.H.

842 Dale, J. E. **Leaf studies and fruiting**

point behaviour. Stomatal physiology. *Progr. Rep. Exp. Stas, Emp. Cott. Gr. Corp. 1957–8 Uganda*, London, 1958, 32–3. [Cott. Res. Sta., Namulonge]

Stomatal behaviour in rain-grown and irrigated cotton was investigated using the infiltration method. During an early-season drought period, the stomata of rain-grown cotton began to close about 9 a.m., were completely closed by 11–12 a.m. and remained closed until about 6 p.m. This did not occur in irrigated cotton, or after rain.—A.M.H

843 MITUI, Y. **Studies on the fine structure of plant cell walls. 1. On the fibrillar system of full matured cotton hair.** [Japanese] *Bot. Mag. Tokyo* 1958, **71**, No. 840, 224–32, bibl. 8, illus., English summary. [Bot. Inst., Univ. Tokyo, Japan]

844 HUTCHINSON, Sir J. and others. **Crop water requirements of cotton.** *J. agric. Sci.* 1958, **51**, No. 2, 177–88, bibl. 15. [Cotton Res. Sta., Namulonge, Uganda]

The calculations reported were made to test the hypothesis that crop water-use may be estimated from the product of leaf area and open water-surface evaporation (E). Data are given on the relationship between water loss from bare soil and climatological factors. The greater the frequency of rainy days, the higher was the ratio of loss from bare soil to loss from open water. The water loss from bare soil with early-sown cotton in June-July was estimated as 0·33E. Estimated weekly total water losses for a cotton crop were calculated on the assumption that direct loss from the soil fell to zero when the leaf cover reached 1 ac./ac. A model of the seasonal progression of water loss was constructed, based on the assumption that the rate of increase of leaf area was exponential until about 16 weeks after sowing. The departure from exponential growth at this stage was closely related to the predicted onset of water stress. The observed water balance in the top foot of soil closely corresponded to that calculated from data on evaporation, leaf area and water supply from rain and irrigation. Estimates of expected yield, based on the supposition that energy for evaporation was not limiting until evapotranspiration reached 1·4E or higher, gave better agreement between expected and observed yields than did estimates based on the more generally accepted hypothesis that the energy limit is reached at 0·8E.—A.M.H.

845 BREGETOVA, L. **[Physiological characteristics and artificial defoliation of cotton.]** [Russian] *Hlopkovodstvo (Cott. Prod.)* 1958, **8**, No. 8, 22–4, illus. [Bot. Inst., Acad. Sci. Tadžik SSR]

In the climate of Central Asia (dry atmosphere, brief dews) a 1% magnesium chlorate spray has proved a better defoliant for cotton than the traditional dusting or spraying with calcium cyanamide. Its slow and gentle action promotes a favourable development of the plants' physiological processes. Because of intensified transpiration, diminished water-deficit and increased water-exchange, 3 or 4 rows of new cells of meristematic tissue are formed across the base of the petiole. Photosynthetic activity increases and starch accumulates. However, 24 hr. after spraying, the water content of the leaves is reduced by 13·5%, the water deficit is trebled and transpiration decreases sharply (on the 4th day it is 50% that of the control plants). Photosynthesis is reduced, chlorophyll and carotene destroyed, and as a result the leaf falls. Stronger solutions (5% magnesium chlorate or 10% calcium cyanamide) produce a herbicidal effect within a few minutes of spraying. Such solutions sharply reduce the physiological processes of the leaves which dry up but do not fall. A defoliant may have a herbicidal reaction if there is an excessive concentration of the solution on the leaf surface owing to evaporation ; the spraying programme must therefore take place at times when evaporation is lowest.—H.B.

846 ERGLE, D. R. **Compositional factors associated with the growth responses of young cotton plants to gibberellic acid.** *Pl. Physiol.* 1958, **33**, No. 5, 344–6, bibl. 9. [Texas Agric. Exp. Sta., College Station]

The height of cotton plants, var. Empire WR, increased with increasing doses of GA, over the range 10–1000μg. per plant. A 1μg. dose had no effect. The number of main-stem nodes was relatively unaffected by treatment. The 10 and 100μg. doses increased fresh- and dry-weights of stems and petioles, but had little or no consistent effect on leaf weights. The 1000 μg. dose did not affect the dry weights of stems and petioles, but drastically reduced leaf dry weight and caused a pronounced chlorosis resembling N deficiency. The sugar concentration in the leaves increased as the level of GA increased, while that in the stems and petioles was lowest at the intermediate GA levels. In stems and petioles, but not in leaves, the cellulose and lignin content increased with increasing GA. Nitrogen and ash contents decreased at the 1000 μg. level of GA.—A.M.H.

847 INDIAN COTTON GROWING REVIEW. **Hormone spraying increases cotton yield in Uttar Pradesh.** *Indian Cott. Gr. Rev.* 1958, **12**, No. 4, 264.

In Uttar Pradesh, the spraying of Punjab American cotton 216F and desi cotton 35/1, at the bud-formation stage, with planofix (α-naphthalene acetic acid) at 5 ppm. increased cotton yields above controls. The increases were 52 lb./ac. for 216F, at Raya, and 102 and 194 lb./ac. for 35/1, at Meerut and Muzaffarnager, respectively.—D.B.

848 Empire Cotton Growing Corporation. **Progress reports from experiment stations. Season 1957-58. Aden Protectorate.** London, 1958, pp. 20.

In a variety trial, Wilds Early yielded the most, giving 1149 lb. lint/ac. At Giar, ammonium sulphate, applied to cotton at 10 g. N per stand and to sorghum at 5 g. N per stand, increased seed-cotton yields by 710 lb./ac. and sorghum-straw yields by 1971 lb./ac. In an NPK experiment at El Kod, there were significant linear responses to sulphate of ammonia and sulphate of potash, each applied at 0, 5 or 10 g. of N or K per sq. m. With Wilds Early, yield continued to increase as the amount of water applied before sowing was increased, up to 40 cm. With BAR XL1, the maximum yield, more than double the commercial average, was reached when 30 cm. water was applied. The ratio of water applied to yield of cotton was almost the same at 20 cm. as at 30 cm. In a preliminary experiment on pre-irrigation sowing, this treatment significantly increased the yield of seed cotton and decreased the plant number per ac., compared with normal post-irrigation sowing.—A.M.H.

FIBRE FLAX

See also Abs. 949, 1016

849 Marani, A. **The relationship between time of harvesting and fibre production in flax under the conditions of Israel.** *Fibra* 1958, **3**, No. 1, 15–20, bibl. 14, English and French summaries. [Fac. Agric., Hebrew Univ., Rehovot, Israel]

Five stages of flax ripening (green, early-yellow, late-yellow, dough, and fully-ripe) are described, and recommendations on time of harvesting flax for fibre in some countries are reviewed. An account is given of 3 field trials to investigate the most suitable time for harvesting flax for fibre in Israel, where flax is grown in winter and harvested in early spring. Results showed that flax in that country should be harvested in the late-yellow- or dough-stage. Highest yields of long fibres and of seeds are obtained at these stages, the seeds being of good quality for both sowing and oil extraction.—E.B.O.

850 Tempe, J. de. Infectie van lijnzaad met *Botrytis*—waardering en bestrijding. ***Botrytis* infection of flax-seed—evaluation and control.** *Tijdschr. PlZiekt.* 1958, **64**, No. 4, 281–96, bibl. 15, illus., Eng. summary. [Rijksproefsta. Zaadcontrôle, Wageningen]

A mixture of thiram and a non-volatile Hg-containing compound, used as a seed-dressing, was found to be more effective in 1958 laboratory- and glasshouse-tests in controlling fungal attack of flax seed by *Botrytis cinerea* and *Ascochyta linicola* than was thiram alone. In the field, equally good stands were obtained with either preparation, but slightly better stands were obtained where volatile Hg-containing seed-dressings were used. In previous years thiram had usually given the best field stands. F. Eng. s.—R.B.

851 Samuels, D. E. J. **A comparison of single retting methods.** *Fibra* 1958, **3**, No. 2, 24–30, bibl. 2, French conclusions. [H.M. Norfolk Flax Establish., England]

A comparison was made of the effects of 6 retting and 2 drying treatments on a single crop of flax straw. The retting methods were : aerated in fresh water ; aerated in matured liquor ; Belgian; circulated ; anaerobic ; and semi-aerated. Field and artificial drying was used. It was found that : (a) all the retting methods tested gave similar monetary returns, with the exception of the aerated rets in fresh water which gave about 10% less than the others; (b) the yield of fibre from the Belgian rets was nearly as low as that from the aerated ret in fresh water, but quality was better ; (c) in some cases, the returns from drying on the Petrie and McNaught dryer were equalled by field drying, but on the whole the former method gave about 9% higher returns. F. s. and concl.—E.B.O.

852 Samuels, D. E. J. and Cox, E. G. **The effect of temperature on the biological retting of flax straw.** *Fibra* 1958, **3**, No. 2, 31–7, bibl. 3, French conclusions. [H.M. Norfolk Flax Establish., England]

To determine the effect of temperature on the retting of flax straw and the maximum permissible temperature for effective retting, 2 series of small-scale rets were carried out in 25-lb. tanks at 8 levels of constant temperature in the range 26°–42°C., one series by the aerated method and the other by the anaerobic method. It was concluded that : (a) the maximum monetary return was obtained by retting at a fairly low temperature (26°–30°C.) but below 30°C. the retting time was prolonged ; (b) the highest fibre quality and most rapid retting were obtained at about 36°C. ; there was no serious reduction in monetary return up to this temperature, especially with the aerated method ; (c) the degree of retting obtained depended on the temperature and on the method of retting ; retting was most complete for the range 34°–38°C. and for the anaerobic method ; these conditions approximate most closely to the standard Belgian method of retting ; (d) the fibre strength at a short test length was not affected by the temperature or method of retting, but there was evidence that the strength at longer lengths was reduced at temperatures above 40°C. F. s. and concl.—E.B.O.

853 Ghyssaert, L. État d'avancement des recherches sur l'épuration des eaux de

rouissage effectuées en Belgique. [**Progress in the investigations on purifying retting water in Belgium.**] *Fibra* 1958, **3,** No. 2, 38–41, English summary. [Cent. Belge Étude Eaux, Gand, Belgium]

The method of purifying water for retting flax by aeration and inoculation with *Saccharomyces cerevisiae*, followed by precipitation with lime, gave better results than other methods tested, but the resulting pH was too high to permit re-use and the iron content was not reduced sufficiently. The English system, used in Norfolk and Lincoln flax mills, was studied and found promising ; but the consumption of electricity with this method was high ; also, the iron content was not reduced by more than 50% ; 75–90% of the volatile fatty acids were removed. F. Eng. s.—E.B.O.

HEMP

854 Estación de Riegos de Córdoba, Spain. 2. Memoria-resumen de trabajos realizados 1953–1956. [**2. Summary report on work at the Córdoba Station for Irrigation (Spain) during 1953-6.**] *An. Inst. nac. Invest. agron.* 1957, **6,** No. 4, 299–388.

Hemp [*Cannabis sativa*], pp. 302–3 and 378. In seed-production trials in 1953, the highest (significant) seed yields were obtained from 12,584 cu.m. of water per ha., of which 1584 cu.m. came from 22 days' rainfall and 11,000 cu.m. from 16 irrigations (the first two of 600 cu.m. each and 14 of 700 cu.m.). Hemp grown for fibre requires 9000–10,000 cu.m. of water per ha.—E.B.O.

KENAF

855 Estación de Riegos de Córdoba, Spain. 2. Memoria-resumen de trabajos realizados 1953–1956. [**2. Summary report on work at the Córdoba Station for Irrigation (Spain) during 1953-6.**] *An. Inst. nac. Invest. agron.* 1957, **6,** No. 4, 299–388.

Kenaf [*Hibiscus cannabinus*], pp. 354–77 and 381. Significant results were obtained in 1954 with the variety Tingo María ; the highest yield, 4219 kg. of dried stems per ha., resulted from 10,395 cu.m. of water (295 cu.m. from 3 days' rainfall and 10,100 cu.m. from 15 irrigations).—E.B.O.

ROSELLE

856 Indian Central Jute Committee, Calcutta. **Annual Report of the Jute Agricultural Research Institute (1956-57).** Calcutta, 1958, pp. 63–5.

In manurial trials with *Hibiscus sabdariffa*, the highest fibre yields were obtained from applying 120 lb. N per acre. P and K, either alone or in combination with N, did not appreciably affect fibre yield. In comparative yield trials, significantly higher fibre yields were obtained from *H. sabdariffa* than from *Crotalaria juncea, Corchorus olitorius, C. capsularis, H. cannabinus*, and *Malachra capitata*.—D.B.

JUTE

857 Director of Agriculture, British Guiana. **Jute.** *Rep. Dir. Agric. Brit. Guiana 1956*, British Guiana, [n.d.], 40–1. [Received August, 1958]

BZ/1, BZ/2 and BZ/3 were suitable varieties for a spring fibre crop. E.C.R. 576, BZ/4 and BZ/5 will produce a seed crop only when a spring crop is taken. All the above varieties gave good autumn fibre crops.—A.M.H.

858 Dutt, N. ***Anomis sabulifera* Guen. and *Apion corchori* Marsh—incidence and control.** *Jute Bull.* 1958, **21,** No. 5, 121–8, bibl. 6. [Jute Agric. Res. Inst., Barrackpore, India]

Data are tabulated showing the effect of different insecticides on the mortality of *Anomis sabulifera* and *Apion corchori* at different stages of their development, and the costs of treatment. Folidol E 605, at a concentration of 0·01%, controls both insects simultaneously. From the tables of insect incidence on jute species in West Bengal it is recommended that in the early part of the season *Corchorus capsularis* should receive priority of treatment and in the later part of the season, *C. olitorius*.—D.B.

859 Indian Central Jute Committee, Calcutta. **Annual Report of the Jute Agricultural Research Institute (1956-57.)** Calcutta, 1958, pp. 121.

(a) Anatomy, p. 14. Statistically significant differences were found in the length, breadth and lumen size of ultimate fibres of 5 varieties (JRC-212, -1, -321, -919 and D 154).

(b) Photoperiod, p. 17. Photoperiodic treatment (10 hr. light + 14 hr. darkness) for 21 days was given to plants at the 15- or 36-day growth stage. When the course of photoperiodic treatment began in the evening, the plants flowered earlier than when treatment began in the morning. The 36-day-old plants responded to short photoperiod better than the 15-day-old plants, and indigenous varieties responded better than exotic ones.

(c) Growth components and fibre yield, p. 18. Bark weight (and therefore fibre production) was more closely related to basal diameter than to height of plants.

(d) Foliar spraying of nutrients, p. 20. 2-month-old plants were sprayed, twice weekly until flowering, with 0·5% solutions of urea, $(NH_4)_2SO_4$, and KNO_3. Fibre yields after retting, from *C.*

capsularis and *C. olitorius*, respectively, were in maunds [1 maund = 82 lb.] : after urea, 18 and 16 ; after $(NH_4)_2SO_4$, 13 and 11 ; unsprayed 10. KNO_3 gave no significant response.
(e) Time of application of N on fibre yield, pp. 23–4. 40 lb. N/ac. from 5 different fertilizers was applied in 1, 2, or 3 instalments. The source of N was shown to be unimportant. Split equal applications at sowing and when the crop was 3 weeks and 6 weeks old were significantly the best treatments.
(f) Effect of manures on seed yield, pp. 24–5. Applications of NPK and NP [amounts not stated] resulted in 6·7 and 4·1 maunds of seed from *C. capsularis* and *C. olitorius*, respectively, whereas without fertilizer the seed yield was 1·78 maunds. When organic manures were applied, increases in seed yield were not significant.
(g) Date of sowing and harvesting on fibre- and seed-yields, p. 28. For fibre yield, the best time for sowing was late April, and the best time for harvesting was the small-pod stage or 140 days after emergence. For seed yield (preliminary trials) the best time for sowing was during June for *C. capsularis* and on 2 June for *C. olitorius*.—D.B.

OIL CROPS

SESAME

860 Varma, K. R. L'huile de sésame. [**Sesame oil.**] *Oléagineux* 1958, **13**, No. 11, 793–801, bibl. 49, illus. [Res. Lab. Tata Oil Mills Co., Bombay]

The information given on sesame (*Sesamum indicum*) includes : cultivation ; areas and yields in different countries ; names in various languages ; and uses.—E.B.O.

OIL-SEED FLAX

See also Abs. 704, 707, 849, 910, 1016

861 Ghamrawy, A. K. and others. **Effect of delayed planting on yield of flax and formation of oil in the linseed.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 131–41, bibl. 15. [Fac. Agric., Cairo Univ. and Fac. Agric., Ain Shams Univ.] [Received Nov., 1958]

Oil-seed flax, var. Hindi, was sown on 15 Oct., 1 Nov. (about normal sowing date), 27 Nov. and 15 Dec. The time taken for the seed to reach maturity decreased in later sowings. The final oil content (44%) was about the same from the 1st and 2nd sowings, but decreased slightly from later sowings. The iodine value of the oil fell from 180 in the early-sown crop to 163 in the latest-sown crop. The highest seed yields were obtained from the first 2 sowings, with significantly lower yields from the later sowings. Straw yields decreased in successive sowings.—A.M.H.

862 Hashad, M. N. and others. **Studies on the formation of oil and its iodine value in the developing linseed.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 37–63, bibl. 19. [Fac. Agric., Ain Shams Univ., and Fac. Agric., Cairo Univ.] [Received Nov., 1958]

Oil formation, and its relation to soluble-carbohydrate content, was studied in seeds of two dual-purpose, native Egyptian flax varieties. The most active period of oil formation in the varieties Baladi and Hindi was 24–27 and 30–33 days after flowering and maximum oil content was reached at 48 and 51 days after flowering, respectively. At this stage chlorophyll was disappearing from the seeds. The greatest increase in iodine value took place after the maximum oil content was reached. For highest yields and quality of both fibre and oil, harvesting at 48 and 51 days after flowering for Baladi and Hindi, respectively, is recommended. The plants should then be stacked and left in the field until the 57th or 66th day while further improvement in oil quality occurs. Studies of the sugar content of the seeds indicated that both reducing sugars and sucrose are precursors of oil in oil-seed flax.—A.M.H.

863 El Damaty, A. H. and El Kobbia, M. T. **Seed yield and oil of linseed as influenced by nitrogen and phosphorus fertilizers treatments.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1956, **1**, No. 1, 77–81, bibl. 9. [Fac. Agric., Ain Shams Univ.] [Received Nov., 1958]

Various N fertilizers applied at 15 kg. N/feddan [1 feddan = 4594 sq. yd.] increased seed yields of oil-seed flax, var. Hindi, by up to 200 kg./feddan. There were no significant differences in effect between the forms of N used. Superphosphate had no effect on yield and none of the fertilizer treatments affected oil content or iodine value.—A.M.H.

SAFFLOWER

864 Parisinos, J. C. **Safflower (*Carthamus tinctorius* L.) as an alternative crop to cereals in Cyprus. 1953-57 investigations.** *Tech. Bull. TB-8 Dep. Agric., Cyprus* 1958, pp. 10, bibl. 1.

An account is given of field trials to compare the economic returns from safflower with those from wheat and barley. It was found that safflower should be sown not deeper than 1–3 in., on deep, fertile soils, of medium to heavy texture, free from weeds. On such land and when 1 irrigation is given, safflower may give yields as good as those from

wheat and barley. The best results were obtained by sowing in late autumn. [See also Abs. 343.] —E.B.O.

SUNFLOWER

865 Cotte, A. Le tournesol-fourrage. [**Sunflowers for fodder.**] *Ann. Amélior. Pl., Paris* 1957, **7**, No. 3, 349–57, bibl. 4, English, Russian and German summaries. [Sta. Amélior. Pl., Montpellier, France]

Data are given on the germination and growth and the effect of rainfall, temperature and light on the fodder yields of sunflower (*Helianthus annuus*), grown in trials at Montpellier and Rennes. Branched varieties were suitable for fodder production. The optimum sowing date was 3 weeks before maize, and recommended plant densities, which depended on soil fertility and moisture, were 15 per sq. m. at Rennes and somewhat less at Montpellier. For feeding green, the recommended harvesting date was 10–12 days before flowering and for silage, at the end of flowering. F. s.—P.J.B.

866 Kamal, M. A. M. and El-Damaty, A. H. **Effect of fertilizer treatments and water levels on yield and composition of sunflower seed varieties.** *Ann. agric. Sci., Fac. Agric., Ain Shams Univ., Cairo* 1957, **2**, No. 1, 137–49, bibl. 16. [Fac. Agric., Univ. Ain Shams, Cairo, Egypt] [Received Nov., 1958]

Three sunflower varieties, Jirassol Tall Russian, Jupiter Sun and Jiranol Sunrise, were grown under 4 fertilizer treatments and received 2 levels of irrigation. Jirassol gave the highest seed yield and Jupiter the lowest. The fertilizer treatments had no effect on yield, but doubling the amount of irrigation water [original level not given] increased yield by 40%. The higher water level increased seed-moisture content in Jirassol only. The percentage N was not significantly affected by fertilizer treatments, water levels or varieties. When expressed as mg./100 air-dried seeds, N content was significantly influenced by water level. Average oil contents as % dry matter were : Jirassol, 29 ; Jiranol, 28 ; Jupiter, 27. The average oil content of sunflower seed was 2% higher than that of pure strains of Egyptian cottonseed and 7% higher that that of commercial grades of cottonseed. The physical and chemical properties of the oil were also studied. F. s.—A.M.H.

RAPE

See also Abs. 869, 883, 960

867 Björklund, C. M. Inför sådden av höstoljeväxter. [**Before sowing winter oil-seed crops.**] *Lantm. Svenskt Land* 1958, **69**, No. 31, 651–3, illus.

Some results of recent research in Sweden on winter rape [*Brassica napus* var. *oleifera* subvar. *biennis*] and winter turnip-rape [*B. campestris* var. *oleifera* subvar. *biennis*] are reviewed. In a series of trials in S. Sweden in 1957, yields of winter rape were little affected by delaying sowing from 5 to 20 Aug., but delaying sowing until 25 Aug. reduced seed yields by over 300 kg./ha. It was concluded that delayed sowing was more harmful to yields of winter rape than to winter turnip-rape and that these crops should be sown before 15 Aug. and before 25 Aug., respectively, in S. Sweden. For S. Sweden, Vestal, Matador and Margo winter rape, in that order, have given highest yields ; of winter turnip-rape varieties, Svalöfs Duro, followed by Weibulls Storrybs, have given the highest yields. Distances between rows of 40–50 cm. have given the best results, with seed rates of 8 kg./ha. for winter rape and 5–6 kg. for winter turnip-rape.—P.J.B.

868 Olsson, G., and Persson, Brita. Inkorsningsgrad och självsterilitet hos raps. **Degree of vicinism and self-sterility in rape.** *Sverig. Utsädesfören. Tidskr.* 1958, **68**, No. 1–2, 74–8, bibl. 7, English summary.

OIL CROPS—GENERAL

869 Lööf, B. Inverkan av olika skördetider på frökvalitet och dråsning hos oljeväxter. **Influence of harvest date upon seed quality and scattering in oil plants.** *Sverig. Utsädesfören. Tidskr.* 1958, **68**, No. 1–2, 61–73, bibl. 7, illus. English summary.

The oil plants mostly grown in Sweden are crucifers. In these, the oil content of the seeds reaches its maximum at, or shortly after, the stage when the pods are yellow and the seeds have become blackish. In winter rape [*Brassica napus* var. *oleifera* subvar. *biennis*], trials have shown an increase in oil content up to 2 or 3 weeks after this stage and then a decrease. Yield per ac. has generally been highest at the yellow-pod stage of maturity. Later harvests have yielded less owing to wind shedding or losses caused by unsatisfactory harvesting methods. If these losses could have been avoided, later harvesting would have produced higher yields because the 1000-grain weight increases for some time after maturity (yellow-pod stage). Specific and varietal differences in shedding are important. White mustard [*Sinapis alba*], *Camelina* [*sativa*] and summer turnip rape [*B. campestris* var. *oleifera* subvar. *annua*] are the Swedish oil plants most resistant to shedding, and these can be directly combined. The risk of wind-shedding after maturity is highest in black mustard [*B. nigra*] and leaf mustard [*B. juncea*] and is not negligible in rape. In windy regions these plants could be cut just before maturity, ripened in the swath and then

threshed by combine, using the pick-up method. A new method presses down the crop by a light roller so as to form a mat of the pods and stalks about 10 in. above the ground, the stand being subsequently combined at a suitable stage of maturity. The content of free fatty acids is not affected by harvest date, but is fairly sensitive to weather conditions. In the author's trials, iodine value was generally not influenced by harvest date. F. Eng. s.—G.M.R.

CROP BOTANY

PHYSIOLOGY

870† Ničiporovič, A. A. **[Photosynthesis and the theory of high crop yield.]** [Russian] *15th Timirjazev Lecture, USSR Acad. Sci., Moscow,* 1956, pp. 94, bibl. 84. [Received Jan. 1959]

This work contains the following sections in which the subject is elaborated : plant nutrition and the processes leading to the formation of the economically useful plant parts, e.g. grain, fruits, tubers ; photosynthesis as the fundamental process in the nutrition of the green plant ; movement of the accumulation of metabolites formed as a result of the activity of the plant's photosynthetic apparatus ; dynamics of the formation of leaf-area as a factor in obtaining high yields ; photosynthesis and radiation intensity ; utilization of the energy of the sun's radiation by sowings of different structure ; the energy balance and water regime of the plant ; productivity of photosynthesis as a factor determining yield ; the daily functioning of photosynthesis under field conditions ; the possibility of increasing the intensity and productivity of photosynthesis ; the carbon-dioxide problem ; and mineral nutrition.—M.H.

871 Ničiporovič, A. A. and Strogonova, L. E. **Photosynthesis and problems of crop yield.** *Agrochimica* 1957, **2**, No. 1, 26–53, bibl. 35, French, German, Spanish and Italian summaries. [Inst. Pl. Physiol., Acad. Sci., USSR, Moscow] [Seen Jan., 1959]

Photosynthesis is directly responsible for the formation of 90–95% of the dry-matter weight of crop plants. The course of formation of the photosynthetic apparatus, as well as its efficiency, is basic to the problem of finding the optimal conditions for crop growth. A distinction is drawn between economic yield (yield of the economically-useful parts of the crop) and biological yield (total dry-weight of the crop), although the two appear to be closely related. An analysis of several crops shows the importance of the photosynthetic potential, defined as the integral of the leaf area of the plant community over the whole vegetative period, expressed in sq.m.-days ; this has been found to vary from 500,000 to 4,000,000. It is suggested that the optimal course of leaf development for annual plants is the attainment of 30–40 thousand sq.m./ha. during a period of 50–60 days, this value being maintained for a period, but decreasing at maturity. If the course of leaf development can be brought to the optimal by improved methods of cultivation, further increases in yield can be obtained only by increasing the rate and productivity of the photosynthetic system, and in optimal conditions, net assimilation rates of 10 g. dry matter/sq.m. leaf area/day can be obtained.—E.B.O.

GROWTH SUBSTANCES

872 Williamson, R. E. **An investigation on the action of maleic hydrazide.** *Diss. Abstr.* 1958, **19**, No. 4, 654. [Univ. Wisconsin, Madison]

Applications of 0·5 and 1 lb. MH diethanolamine salt, as an oil emulsion, were applied to wheat at 8 growth stages ranging from the winter-dormant to the early soft-dough stage. All treatments, except at the last growth stage, reduced grain yields. The response of rye treated with MH at the late-boot to early-head stages was similar to that of wheat. The primary root tips of *Vicia faba* seedlings were exposed to aqueous solutions of the acidic form of MH for up to 24 hr. Concentrations of 10 ppm. MH effectively reduced cell mitosis and after 24 hr. in MH solutions, transfer to distilled water did not result in the resumption of a high rate of mitosis. There was some antagonism between MH and IAA in plants, but this did not appear to be the primary cause of the action of MH on plants ; MH inhibited the function of more than one enzyme system.—P.J.B.

873† Wittwer, S. H. and Bukovac, M. J. **The effects of gibberellin on economic crops.** *Econ. Bot.* 1958, **12**, No. 3, 213–55, bibl. 204, illus. [Dep. Horticulture, Michigan State Univ., East Lansing]

This is a review article.—R.B.

874 Bünsow, R. Anwendungsmöglichkeiten der Gibberelline. **[Possibilities for using gibberellin.]** *Angew. Bot.* 1958, **32**, No. 5, 186–96, bibl. 57. [Univ. Göttingen, W. Germany]

This is a review of the literature on the action of gibberellin in promoting growth, flowering (in *Beta* spp., *Brassica* spp. and *Daucus* spp., but not cereals) and fruit development, and in breaking dormancy.—D.B.

875† Chouard, P. Diversité des mécanismes des dormances, de la vernalisation et du photo-

périodisme révélée notamment par l'action de l'acide gibbérellique. [**Different mechanisms in dormancy, vernalization and photoperiodism revealed, especially by the action of gibberellic acid.**] *Bull. Soc. bot. Fr. Mém. 1956–7*, 1957 51–64, bibl. 32.

This is partly a review of the literature and partly an account of original research. Many types of plant species are considered.—E.B.O.

NUTRITION

876† Petinov, N. S. [**The water relations and irrigation of crops.**] [Russian] *Vsesojuz. Obšč. Rasprost. Polit. i Nauč. Znanii* 1958, Ser. 8, No. 1, Pt. 6, bibl. 16, illus.

The subject is reviewed from the following aspects : the significance of water in plant life ; forms of soil-water and their entry into the plant ; methods for determining the irrigation regime of crops ; physiological peculiarities of crops with optimal and deficient water supplies and nutrients; the physiological nature of crop productivity and measures for increasing it.—M.H.

877† Petinov, N. S. (Ed.). [**Biological bases of irrigation farming.**] [Russian] Acad. Sci. USSR, Timirjazev Inst. Pl. Physiol. Collected papers, by various authors. Moscow, 1957, pp. 711. 42 roubles. [Received Aug., 1958]

A conference was held in Moscow during 1955 on this subject. The papers submitted are compiled in this work and classified in 4 parts : (1) the present position of scientific research on the water regime of agricultural plants ; (2) the water requirements of crops ; (3) problems of raising crop productivity by the use of irrigation in plant industry ; (4) basic laws in the behaviour of soil moisture and their significance for life-processes in the plant. Resolutions passed by the Conference in connexion with these four sections are recorded. [See also Abs. 878, 879.]—M.H.

878† Gusev, N. A. [**The present position and future progress regarding studies on the water regime of plants.**] [Russian] [Contained in] Biological bases of irrigation farming. Moscow, 1957, pp. 72–85, bibl. 42. [Received Aug., 1958] [Biol. Inst., Kazan Filial Acad. Sci., USSR]

This is a review where attention is drawn to the work on this subject by the above Academy dating from 1946, in which the influence of electrolytes and temperature on the plants' water regime is considered, in addition to that of osmotic laws. [See Abs. 877.]—M.H.

879† Petinov, N. S. [**The present position and ways of further development of irrigation research, and the theory of the water regime in agricultural plants.**] [Russian] [Contained in] Biological bases of irrigation farming. Moscow, 1957, pp. 16–71, bibl. 274. [Received Aug., 1958]

The subject is reviewed in 7 sections among which are : methods for determining the lower limit of soil moisture for crops ; indicators of the water regime in plants which is characteristic of the plants' physiological activity (see Petinov, *Pl. Physiol. USSR*, Vol. 1, No. 1) ; irrigation methods ; systems of nutrition ; and increasing crop productivity. [See Abs. 877.]—M.H.

880† Rothwell, D. F. **The effect of lime on root distribution.** *Proc. Soil and Crop Sci. Soc. Fla* 1957, **17**, 67–71, bibl. 22. [Univ. Florida, Gainesville] [Received Nov., 1958]

Literature on the effect of lime on root development in a variety of crops, mostly legumes, is reviewed.—A.M.H.

881† Chamura, S. **Studies on the relation between the tolerance of crop to soil acidity and low pH. 2. Distribution of Ca in crops. 3. Absorption of cation by cytoplasmic protein.** [Japanese] *Proc. Crop. Sci. Soc. Japan* 1958, **26**, No. 3, 261–4, bibl. 10, English summary. [Niigata Univ.]

882† Nömmik, H. Klor—ett oumbärligt mikronäringsämne för de högre växterna. **Chlorine—a micronutrient element for higher plants.** *Växt-närings-Nytt* 1958, **14**, No. 1, 12–16, bibl. 4, illus., English summary.

The results of recent research in the USA on the role of Cl as a micronutrient for higher plants is discussed.—P.J.B.

883† Gunnarsson, O. Svavel—ett aktuellt växtnäringsämne. **Sulphur—a plant nutrient in vogue at present.** *Växt-närings-Nytt* 1958, **14**, No. 2, 12–17, illus., English summary.

The sources of the supply of sulphur to plants in Sweden, both from fertilizers, and from natural sources such as precipitation and the atmosphere, are considered. The results are given of pot trials, in which S-deficiency was induced in red clover, mangels and rape.—P.J.B.

884 Jordan, H. V. and Bardsley, C. E. **Response of crops to sulfur on southeastern soils.** *Proc. Amer. Soc. Soil Sci.* 1958, **22**, No. 3, 254–6, bibl. 6, 2 maps. [Mississippi Agric. Exp. Sta., State College]

885 Henkens, C. H. **The trace element boron : the state of research in the Netherlands.** *Neth. J. agric. Sci.* 1958, **6**, No. 3, 183–90, bibl. 33. [Inst. Soil Fertility, Groningen, Netherlands]

This is a review of the literature.—R.B.

886 Webb, R. A. **Trace elements and crop production in the tropics.** *J. Sci. Fd*

Agric. 1957, **8**, Suppl. S26–31, bibl. 6. [Received Dec., 1958]

The occurrence of micronutrient deficiencies in tropical soils and the use of the subtractive method for diagnosis of such deficiencies in pot- and field-trials are discussed.—A.M.H.

887 Bertrand, D. Oligo-éléments des végétaux cultivés. [**Trace elements in crop plants.**] *Qual. Plant. et Materiae veg.* 1958, **3–4**, 569–605, bibl. 157. [Institut Pasteur, Paris]

This is a review of the literature.—R.B.

CHEMICAL ANALYSES AND COMPOSITION

888 DeKock, P. C. and Morrison, R. I. **The metabolism of chlorotic leaves. 1. Amino acids. 2. Organic acids.** *Biochem. J.* 1958, **70**, No. 2, 266–72, bibl. 26 and 272–7, bibl. 21. [Macaulay Inst. Soil. Res., Craigiebuckler, Aberdeen]

Free amino- and organic-acids were determined in chlorotic leaves of *Pisum sativum* suffering from nickel toxicity, mustard (*Sinapis alba*) and sugar-beet (healthy and infected with virus yellows).—A.M.H.

889† Virtanen, A. I. **Investigations on antimicrobial substances formed in cereals and fodder plants and their importance for the resistance of plants to pathogenic fungi.** *G. Microbiol.* 1956, **2**, 15–32, bibl. 9, illus. [Biochemical Inst., Helsinki, Finland] [Received Oct., 1958]

TECHNIQUES AND APPARATUS

890 Giang, P. A. and Schechter, M. S. **Colorimetric method for estimation of guthion residues in cottonseeds and cottonseed oil.** *J. agric. fd Chem.* 1958, **6**, No. 11, 845–8, bibl. 20, illus. [Agric. Res. Serv. U.S. Dep. Agric., Beltsville, Md]

891† Spreafico, L. L'analisi delle sementi. [**Seed analysis.**] *Quad. 4 Ente naz. Sementi elette* 1958, pp. 29, illus. [Milano, Italy]

In this paper for farmers, information is given on seed analysis—in particular on sampling and on laboratory determinations. A table shows the methods for determining the germinating capacity of seeds of many crop species.—E.B.O.

892† Gils, A. and Moumm, N. Méthodes d'analyses minérales. [**Methods of chemical analyses.**] *Sér. tech. 54 INÉAC* 1958, pp. 31, bibl. 21.

This publication consists of 2 papers (in French) : Technique for rapid chemical analyses suitable for the study of the mineral nutrition of plants, by A. Gils and N. Moumm ; and Zinc determination in plants and culture solutions, by N. Moumm.—E.B.O.

893† Willey, L. A. and Dent, J. W. **Note on a method for sampling green crops for dry-matter determination.** *Emp. J. exp. Agric.* 1958, **26**, No. 104, 379–81, bibl. 1, illus. [Nat. Inst. Agric. Bot., Cambridge]

Dry-matter determinations for crops such as kale, silage maize and rape are often made on samples consisting of only 1–2% of the plot yield, thus involving considerable sampling error. A method is described in which all the green material from a given plot is passed through a mechanical chopper before sampling. The method is rapid and gives samples which are highly representative, even for those crops which show wide variations in the composition of different parts of the plant. The chopped sample material is also in a form very suitable for oven drying.—A.M.H.

894† Murphy, R. P. **A method for the extraction of plant samples and the determination of total soluble carbohydrates.** *J. Sci. Fd Agric.* 1958, **9**, No. 11, 714–17, bibl. 4. [Soil Lab., Johnstown Castle Agric. Coll., Wexford, Republic of Ireland]

A method is described for the determination of total soluble carbohydrates in plant samples. The plants are frozen in dry ice as soon as they are cut, portions are extracted with 80% ethanol in an Elco Homogenizer and the carbohydrate is estimated by the anthrone reaction. F.s. —A.M.H.

895 Dale, J. E. **The use of the infiltration method in the study of the behaviour of the stomata of Upland cotton.** *Emp. Cott. Gr. Rev.* 1958, **35**, No. 4, 254–9, bibl. 12. [Emp. Cott. Gr. Corp., Namulonge, Uganda]

Some factors involved in the use of the infiltration technique for studying stomatal behaviour are discussed and preliminary results, using cotton, are described. Leaf age was an important factor in the choice of test material, as young leaves showed a higher resistance to infiltration than older ones. This was apparently associated with incomplete development of the stomatal apparatus and intercellular spaces. For fully turgid plants. there was a high correlation between leaf resistance, as measured with a Wheatstone bridge porometer, and resistance to infiltration, using iso-butanol/ethylene glycol mixtures.—A.M.H.

896 Krug, H. Zusatzbelichtung im Pflanzenbau. [**Supplementary lighting in crop cultivation.**] *Landbauforschung* 1958, **8**, No. 1, 18–20, bibl. 9. [Forschungsanst. Landw., Braunschweig-Völkenrode, W. Germany]

The paper briefly reviews the properties of the various types of lamp used for supplementary

lighting, their effect on plant growth and the purposes for which the various lamps can be used, especially in potato growing, e.g. chitting, stimulating flower production in breeding work, testing for disease in seed tubers, and photoperiodic experiments.—D.B.

897† Marais, P. G. **An automatic interval-timer for use in isotope research.** *S. Afr. J. agric. Sci.* 1958, **1**, No. 2, 129–33, bibl. 7, illus., French and Afrikaans summaries. [Western Province Fruit Res. Sta., Stellenbosch]

An electronic device for measuring time intervals ranging from one-fiftieth of a second to 33 min. is described. The time pulses are provided by the mains frequency, and by connecting the interval-timer with an isotope-registering apparatus, the whole unit is automatically switched off after a certain predetermined number of pulses has been recorded. For use in isotope work in agricultural research, it is superior to other, more accurate instruments because of its shorter measuring time, involving less risk of radiation effects on the normal growth and functions of plants.—A.M.H.

898† Holmes, R. M. and Robertson, G. W. **Note on a portable field growth chamber for winter injury studies.** *Canad. J. Pl. Sci.* 1958, **38**, No. 3, 377–9, illus. [Canad. Dep. Agric., Ottawa, Ont.]

A description is given of a bottomless, insulated aluminium chamber, approximately a 5-ft. cube, equipped with heaters and fluorescent lights, and devised for inducing growth revival in lucerne during winter. It is proposed to use this apparatus for determining the time and cause of winter injury by reviving the growth of plants at any desired period of winter.—D.A.L.

899† Wiersum, L. K. Ionenopname en-transport. [**Absorption and transport of ions.**] *Landbouwk. Tijdschr., Wageningen* 1958, **70**, 327–33, [Suppl.], bibl. 39. [Inst. Soil Fertility, Groningen]

A number of examples of cases in which radioactive isotopes can be used for studying the uptake and transport of ions in plants are briefly described.—P.J.B.

900† Orsini, F. F. N. Radioisótopes en biología animal y vegetal. Aplicaciones diversas. [**Radioisotopes in animal and plant biology. Various applications.**] *Bol. 35 Fac. Agron. Vet. Univ. Buenos Aires* 1958, pp. 98, English summary.

The principal applications of radioisotopes to the study of plant biology are reviewed.—E.B.O.

RADIOBIOLOGY

See also Abs. 1058

901† Silow, R. A. **The potential contribution of atomic energy to development in agriculture and related industries.** *Publ. FAO/58/6/4402* 1958, pp. 80, bibl. 28. [Atomic Energy Branch]

The subject-matter is reviewed with the object of providing a basis for policy decisions to be taken by agricultural authorities, especially in countries which have had so far only limited experience in atomic energy. The principal aspects considered are: the applications of nuclear-derived power; the use of radiation in the preservation and processing of food, and in plant breeding; the value of radioisotopes in agricultural research. The possibility of using ionizing radiations to preserve grain and other foodstuffs has been demonstrated experimentally but the conditions under which this will be feasible on a commercial scale have not yet been clearly established. It is concluded that through the use of radiation and radioisotopes, which have a wide range of applications in agricultural research, atomic energy will play an increasingly important part in the development of the agricultural resources of the world.—E.B.O.

902† Russell, R. S. and Ellis, F. B. **The movement of strontium^{90} through food chains.** *Soils and Ferts* 1958, **21**, No. 5, 269–73, bibl. 15. [Agric. Res. Council Radiobiological Lab., Grove, Wantage, England]

The routes through which ^{90}Sr from radioactive fall-out may reach human food are described. The relationship between absorption of Ca and Sr in plants growing in water culture or in soil and the mechanisms of absorption of Sr by plants are discussed. The importance of "stem-base" absorption, particularly in hill pastures, is stressed. The difficulties of estimating the extent to which ^{90}Sr entering the soil will be absorbed by plants are examined.—A.M.H.

903 Auerbach, S. I. and Crossley, D. A., Jr. **Strontium-90 and cesium-137 uptake by vegetation under natural conditions.** *Nuclear Sci. Abstr.* 1958, **12**, No. 20 (supplement), 1755. [Oak Ridge Nat. Lab., Tennessee] [Abstract of paper prepared for 2nd U.N. Internat. Conf. Peaceful Uses of Atomic Energy]

Maize plants sown on the bed of a drained lake previously used as a dump for radioactive waste were subjected to chemical and radiochemical analyses. Preliminary measurements indicated that ^{137}Cs taken up by the maize was not equally distributed throughout the plant; leaves contained more ^{137}Cs than did the grain. A comparison between the content of available ^{137}Cs in the soil, as measured by the ammonium acetate method, and its content in the plant revealed a considerable discrimination against uptake of this element. F. abstr.—R.B.

904 Guljakin, I. V. and Judinceva, E. V.

[The intake of ^{60}Co by plants and its accumulation in crops.] [Russian] *Doklady Akad. Nauk SSSR (Proc. Acad. Sci. USSR)* 1958, **123**, No. 2, 368–70, bibl. 4. [Timirjazev Agric. Acad., Moscow]

To determine the behaviour of ^{60}Co in the plant and its accumulation in different organs during growth, water- and sand-cultures of *Triticum persicum* and of *Pisum sativum* var. Capital were studied. In the water cultures ^{60}Co was added at a rate of 0·25 μc./vessel of 5·5 l. capacity; in the sand cultures the rate was 0·1 μc./vessel of 3·5 kg. sand. These doses did not affect plant growth adversely. Co accumulated chiefly in the roots (80–98% of the plant's total Co). Absorption of Co proceeded throughout the vegetative period and achieved its maximum at ripening. However, the content of ^{60}Co per unit of dry substance lessened as growth advanced, until, in ripe wheat, the amount was 5 times less (in peas 2·5 times less) than in young plants. This lessening occurred in both vegetative and reproductive organs. As to the above-ground organs, the ^{60}Co concentration in wheat leaves was 5 times less at the milk stage than in the stooling stage, but in ears without grain the concentration was almost 3 times greater at the milk stage ; this indicates an irregular relative distribution of ^{60}Co in the different above-ground organs. The data also showed that, under uniform conditions, radioactive Co accumulates in greater amounts in peas than in wheat, especially in sand cultures. The pea seed in sand cultures contained $8{\cdot}6 \times 10^{-4}$ μc.^{60}Co/g. dry matter, compared with $1{\cdot}6 \times 10^{-4}$ in the wheat grain.—M.H.

WEEDS AND WEED CONTROL

Where weeds are specific to a crop, see under the crop concerned. See also Abs. 1051, 1077

905† PALMER, J. H. **Studies in the behaviour of the rhizome of *Agropyron repens* (L). Beauv. 1. The seasonal development and growth of the parent plant and rhizome.** *New Phytol.* 1958, **57**, No. 2, 145–59, bibl. 14. [Bot. Dep., Univ. Coll. W. Indies, Jamaica]

The data recorded show that rhizome growth can be induced during the winter under warm greenhouse conditions by increasing the intensity of illumination of the plants to within the range 500–2000 ft.-candles. No rhizome growth occurs under natural conditions when the illumination intensity is reduced to approximately 3% of the noon summer value. When rhizome growth is induced to begin approximately 4 weeks prematurely, then this growth ceases in mid-July. It is concluded that rhizome growth is dependent upon the plant being brightly illuminated and that rhizome initiation in the spring is controlled by environmental factors, while rhizome cessation among plants in closed communities is most probably the result of the parent aerial shoots becoming senescent. F. s.—M.H.

906 JOHNSON, B. G. and BUCHHOLTZ, K. P. **An enzymatic study of the dormancy of quackgrass rhizomes.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 11. [Univ. Wisconsin, Madison]

The results are reported of studies on the IAA-oxidase system of *Agropyron repens* and its relation to the dormancy of buds on the rhizomes. —P.J.B.

907 BUCHHOLTZ, K. P. and JOHNSON, B. G. **The influence of leaching on the control of quackgrass with dalapon and 2,3,6-TBA.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 28. [Univ. Wisconsin, Madison]

In field and glasshouse trials, effective control of *Agropyron repens* was secured only where dalapon or 2,3,6-TBA were incorporated into the soil. In field trials, rainfall leached these herbicides into the soil and their effectiveness was much reduced when no rainfall occurred between the time of treatment and ploughing. Applying these herbicides to the foliage, only, of *A. repens* gave relatively poor control of shoot regrowth, while applying them to the soil surface only, gave effective results. —P.J.B.

908 JOHNSON, B. G. and BUCHHOLTZ, K. P. **The natural bud dormancy of quackgrass rhizomes.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 29. [Univ. Wisconsin, Madison]

Techniques for evaluating bud dormancy in *Agropyron repens* are outlined. In studies during 2 years, more than 90% of buds in early spring were active. Between mid-April and early June, the proportion of active buds dropped to 5%, and remained at about that level during June. During July, the proportion of active buds began to rise slowly. New buds were initiated during the period when mature buds became dormant. At no time did all dormant mature buds recover activity, though almost all newly-initiated buds regained their activity during the autumn. The new rhizomes overwintered to become the mature rhizomes of the following year. After the initiation of new rhizomes, the old, mature rhizomes deteriorated rapidly in condition during summer and autumn and only a few succeeded in overwintering. The dormancy exhibited by rhizome buds appeared to be an endogenous phenomenon.—P.J.B.

909 GREEN, J. G. and HELGESON, E. A. **The developmental morphology of wild**

oats. *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 5–6. [N. Dakota Agric. Exp. Sta., Fargo]

Observations are made on the germination, growth, development of leaves, roots, tillers and reproductive parts of wild oats.—P.J.B.

910 Canvin, D. T. and Friesen, G. **The herbicidal action of IPC and CDAA on wild oats and several crop plants.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 6–7, bibl. 3. [Univ. Manitoba, Winnipeg]

Studies were made of the toxicity of concentrations of IPC and CDAA ranging from 0·01 to 1000 ppm., as measured by root-growth inhibition in wild oats, barley, peas and oil-seed flax. The differences between barley and wild oats in response to IPC and CDAA were small and it was concluded that selective control of wild oats in barley with herbicides was not feasible. Oil-seed flax and peas tolerated concentrations of CDAA up to 10 ppm. Oil-seed flax showed the greatest tolerance to IPC and showed no growth inhibition in 1 ppm. concentrations. Peas were susceptible to concentrations of IPC as low as 0·1 ppm. Observations were made on the cytological effects of IPC and CDAA.—P.J.B.

911 Helgeson, E. A. and Green, J. G. **Phytotoxic properties of wild oat extracts.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 38–9. [N. Dakota Agric. Exp. Sta., Fargo]

Non-dormant wild oats were germinated on filter papers moistened with leachings from the seeds, leaves or stems of wild oats. Whole seed extracts had little effect on germination, but reduced seedling-root growth at all concentrations used. seedling shoots were relatively less sensitive to leachings from whole seeds and low concentrations (1 g. plant material per 40 ml. water) of leachings resulted in some growth stimulation. Extracts of wild oat lemmas and paleas (1 : 5 concentration) reduced germination and root and shoot growth of seedlings. Shoot growth was more sensitive to concentrations greater than 1 : 20 than was root growth. Caryopsis extracts reduced germination somewhat at concentrations greater than 1 : 10 and inhibited the growth of tops more than of roots. Glume extracts had little effect on germination, but concentrations of 1 : 10 markedly reduced top growth. Concentrations of 1 : 30 stimulated top and root growth. Leaf extracts (1 : 10) reduced germination and markedly inhibited top- and root-growth. Extracts of panicle stems completely prevented germination and seedling growth at 1 : 10 concentrations. The toxic principle in the extracts was heat-stable, was lost on dialysis and was absorbed on activated charcoal.—P.J.B.

912 Green, J. G. and Helgeson, E. A. **The effect of gibberellic acid on dormant seed of wild oats.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 39. [N. Dakota Agric. Exp. Sta., Fargo]

The germination of dormant seed of wild oats after 10 days on filter papers soaked in concentrations of 0, 25, 50 and 100 ppm. GA was 17, 23, 81 and 88% respectively. There was evidence that the older the wild oat seed, the greater was the effect of GA in promoting the germination.—P.J.B.

913 Helgeson, E. A. and Green, J. G. **Retarding abscission of wild oat seed with chemicals.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 39–40. [N. Dakota Agric. Exp. Sta., Fargo]

In an attempt to prevent early abscission of wild oat seed, plants were treated in the glasshouse with NAA, 2,4-D and the K salt of GA, applied to the soil, as foliage sprays, or in lanolin paste applied to the base of the spikelets. NAA and the K salt of GA, applied in lanolin paste just after fertilization, were the most effective.—P.J.B.

914 Meadly, G. R. W. **Weeds of Western Australia. Wild turnip (*Brassica tournefortii* Gouan).** *J. Dep. Agric. W. Aust.* 1958, **7**, No. 4, 441–4, illus.

Wild turnip can be controlled by bare fallowing, after heavy sheep-stocking. Further control can be obtained by delaying sowing of the crop in the following year until free germination of the weed has been induced by autumn rains. Spraying with 4 oz. a.e. 2,4-D or MCPA in 5–8 gal. water/ac., when the cereal crop is 6–8 in. high and tillering, is recommended.—A.M.H.

915† Meadly, G. R. W. **Weeds of Western Australia. Watsonia (*Watsonia* spp. and *Chasmanthe aethiopica* (L.) N. E. Brown).** *J. Dep. Agric. W. Aust.* 1958, **7**, No. 5, 541–3, illus.

Watsonia can be controlled by grubbing, where this is practicable, or by deep-ploughing, or working with a rotary hoe and removing as many corms as possible. These operations should be carried out early in the winter, before flowering stems have appeared. Ploughing should be followed by establishment of vigorous pasture spp. Chemical methods are not very satisfactory, but, for areas where cultural methods cannot be used, spraying with 3 lb. a.e. 2,4-D ester in 100 gal. diesolene/ac., during July or August, is recommended. This does not give complete control in one season, because of dormant corms.—A.M.H.

916 Schultz, R. E. and others. **Seed production in Canada thistle and perennial sowthistle.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 8–9. [S. Dakota State Coll., Vermillion]

In 2-years' trials with *Cirsium arvense* and *Sonchus arvensis*, over 80% of achenes of *C. arvense*

were viable 11 days after the heads opened in 1956 and 9 days after in 1957. With *S. arvensis*, a high percentage of achenes were viable on 9-day-old heads in 1956 and on 8-day-old heads in 1957. These results indicated that to prevent viable seed production, these spp. should be mown before the flowers are 8–10 days old. Spraying with 0·5 lb. a.e. of 2,4-D ester/ac. a few days before the heads opened resulted in almost complete sterility of achenes in *C. arvense* and complete sterility in *S. arvensis*. There was evidence that insects were important for pollinating both spp. ; pollination by wind was very low. *S. arvensis* was largely self-sterile, though flowers were bisexual.—P.J.B.

917 Bondarenko, D. D. **The absorption and translocation of C^{14}-labeled ATA and 2,4-D in Canada thistle (*Cirsium arvense*).** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 9–10. [Ohio Agric. Exp. Sta., Columbus]

918 Zilke, S. and Derscheid, L. A. **Factors affecting germination of Canada thistle and perennial sowthistle seeds.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 42–3. [S. Dakota State Coll., Vermillion]

Studies were made of the effect of soil moisture, soil temperature, light and depth of incorporation into the soil, on the germination of *Cirsium arvense* and *Sonchus arvensis* seed. Holding freshly-harvested seed in cold for 7 days, light for 4 days, followed by darkness, was effective for breaking its dormancy. The emergence of *C. arvense* over a 10-day period in soil held at 64, 72 and 88°F. was 22, 32·5 and 53% and that of *S. arvensis* was 1·5, 10·5 and 15%, respectively. The emergence of *C. arvense* from soil held at full, half and quarter field moisture capacity was 1·5, 14·2 and 18·2% and that of *S. arvensis* was 0·8, 0·5% and nil, respectively. The results are given of studies of the emergence of these spp. under different soil temperature and moisture conditions in the field in eastern S. Dakota. *C. arvensis* would not emerge when sown deeper than 1·2 in. ; for *S. arvensis*, this depth was 0·8 in. Seed of *C. arvensis* emerged most rapidly when sown at the shallowest depth used (0·2 in.). —P.J.B.

919 Wiese, A. F. and Rea, H. E. **Control of field bindweed, blueweed and Indian rushpea with chlorinated benzoic acids and other sterilizing chemicals.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 24. [Texas Agric. Exp. Sta., College Station]

Tests were made of the effectiveness of different soil sterilants against *Convolvulus arvensis*, *Helianthus ciliaris* and *Hoffmanseggia densiflora*, grown on silty clay loam. Against *C. arvensis*, polychlorobenzoic acid at 0·5 and 0·25 lb./sq. rod (1 rod = 5·5 yd.), erbon at 2 lb., fenuron at 0·375 lb. and 2-(2,4,5-TP) ester at 0·5 lb./sq. rod, were effective. *H. ciliaris* was eradicated by sodium tetraborate at 16 lb./sq. rod, polychlorobenzoic acid at 0·5 and 0·25 lb., 2-(2,4,5-TP) ester at 0·5 lb. and 2,4-D amine at 0·5 lb./sq. rod. No herbicide eliminated *H. densiflora*, though 2-(2,4,5-TP) ester at 0·5 lb./sq. rod gave 98% control.—P.J.B.

920 Steinbauer, G. P. and Grigsby, B. **Field and laboratory germination of the seeds of bindweeds, velvet leaf and ladysthumb.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 8. [Michigan Agric. Exp. Sta., East Lansing]

Best germination of hard seed of *Convolvulus arvensis* was obtained by treating the seed with concentrated H_2SO_4 for 1 hr., followed by rinsing for 0·5 hr. in running water and germinating at 20–30°C. With hard seed of *Abutilon theophrasti*, immersion in concentrated H_2SO_4 for 15 min., followed by rinsing in water for 1 hr., effectively broke dormancy. With hard seed of *Polygonum persicaria*, the most successful treatment was to immerse the seed in concentrated H_2SO_4 for 15 min., rinse for 1 hr., then pre-chill the seed at 5°C. for 7 days.—P.J.B.

921 Friesen, H. A. and Forsberg, D. E. **Neburon as a selective herbicide for tartary buckwheat and wild buckwheat.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 26–7. [Exp. Fm, Lacombe, Alberta (1) and Exp. Fm, Scott, Saskatchewan (2)]

The results are given of investigations in the Prairie Provinces on the effectiveness of neburon against *Fagopyrum tataricum* and *Polygonum convolvulus*. Applications of 3 lb. neburon/ac. would give complete kill of *F. tataricum* when applied not later than the 4-true-leaf stage and of *P. convolvulus* at a slightly later growth stage. Cereals treated with 4 lb. neburon/ac. showed no ill effects. Neburon had no material effect on a number of other weeds, including *Chenopodium album*, *Polygonum persicaria*, *Amaranthus* sp., *Salsola kali* and *Thlaspi arvense*. 2,4-D esters suppressed the growth of *F. tataricum* and *P. convolvulus* and partially inhibited seed setting, but did not give the degree of kill secured with neburon.—P.J.B.

922 Vanden Born, W. H. and Corns, W. G. **Studies on seed dormancy, plant development and chemical control of Tartary buckwheat (*Fagopyrum tataricum* (L.) Gaertn.). 1. Seed dormancy.** *Canad. J. Pl. Sci.* 1958, **38**, No. 3, 357–66, bibl. 12. [Univ. Alberta, Edmonton]

The effects of various physical, chemical, and storage treatments on dormancy of seeds of Tartary buckwheat were studied. Dormancy was apparently not caused by any one single factor, but there was a highly significant interaction between

the effect of length of storage and method of storage upon dormancy.—D.A.L.

923 Vanden Born, W. H. and Corns, W. G. **Studies on seed dormancy, plant development, and chemical control of Tartary buckwheat (*Fagopyrum tataricum* (L) Gaertn.). 2. Germination, growth, flowering and seed production.** *Canad. J. Pl. Sci.* 1958, **38**, No. 3, 367–73, bibl. 9, illus. [Univ. Alberta, Edmonton]

After-ripened seeds of Tartary buckwheat germinated in the laboratory over a wide range of temperatures, and were capable of producing seedlings in the field throughout the growing season. Seedlings were produced at sowing depths of up to 6 in., and within 10 weeks of sowing the plants flowered, and the first seeds matured. Abnormal seeds produced by spraying plants with a 2,4-D preparation of low volatility were as viable as normal seeds, and produced plants normal in all respects.—D.A.L.

924 Department of Agriculture, New South Wales. **Weeds.** *Rep. Dep. Agric. N.S.W. 1957*, Sydney, 1958, 29–30.

Serrated tussock [*Nassella trichotoma*] can be controlled under arable conditions by preparing a fine seedbed and sowing pasture spp. in autumn. In semi-arable areas, it can be controlled by burning, followed by chisel-ploughing before sowing pasture spp. It is effectively killed by dalapon and TCA. Low rates of dalapon and TCA (5 and 20 lb. [? per ac.], respectively) retarded growth of burnt tussock and allowed oversown clovers to compete with it. As little as 0·5 lb. 2,4-DB/ac. controlled stagger weed [*Stachys arvensis*] and lesser swine cress [*Coronopus didymus*]. Most weed seeds were destroyed by soil fumigation with 1·5–2 lb. vapam per 100 sq. ft.—A.M.H.

925† Marinos, N. G. **The control of soursob (*Oxalis pes-caprae*) with vapam.** *J. Aust. Inst. agric. Sci.* 1958, **24**, No. 3, 259–61, bibl. 1. [Dep. Pl. Physiol., Waite Agric. Res. Inst., Adelaide]

When applied at flowering, vapam at 200 lb./ac. effectively prevented formation of new bulbs of *O. pes-caprae*. The method is unlikely to be of use for large-scale control because of its cost and the need for subsequent irrigation.—A.M.H.

926 Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization, Australia. **Ecological studies on weeds.** *Rep. C.S.I.R.O. 1956–7*, Canberra, 1957, 28–9. [Received Sept., 1958]

Spraying skeleton weed (*Chondrilla juncea*) with selective herbicides [not named] 30–50 days before sowing wheat, or at the seedling stage of oats, resulted in less competition for N and higher grain yields than normal commercial spraying in spring. Spraying with MH [rate not given] delayed flowering of *Paspalum dilatatum*, the inflorescences of which hinder the flow of water in farm ditches, but did not kill the plants, thus there was no disturbance of the ditches. *Typha* sp. in main drainage channels was controlled by 6 lb. 2,4-D/ac. The effectiveness of control was increased by maintaining a high water-level in the channel after spraying. —A.M.H.

927 Bayer, D. E. **Some factors affecting the germination of seeds and plant responses to herbicides of three species of smartweed *Polygonum pennsylvanicum* L., *Polygonum persicaria* L., and *Polygonum lapathifolium* L.** *Diss. Abstr.* 1958, **19**, No. 3, 622–3. [Univ. Wisconsin, Madison]

Seeds of *P. pennsylvanicum* and *P. persicaria* after-ripened most rapidly when submerged for 4–6 weeks in water at 2°C. Seeds of *P. lapathifolium* after-ripened slightly more rapidly in KNO_3 solution than in water at 2°C., but otherwise differed little from the other 2 spp. After-ripening was hastened by removing the seed-coats with H_2SO_4, or by puncturing them. Only in the case of *P. lapathifolium* did light increase seed germination. Secondary-dormancy in *P. pennsylvanicum* and *P. lapathifolium* was more complete and lasted longer than in *P. persicaria*. All 3 spp. were effectively controlled by pre-emergence treatment with PBA-1 (61% 2,3,6-trichlorobenzoic acid ; 29% 2,4,5-trichlorobenzoic acid), IPC, CIPC, 3 triazine compounds and simazin. Except for IPC and CIPC, these herbicides were also effective as post-emergence treatments, as were 4-CPA (4-chlorophenoxyacetic acid), 2,4-DB and 2,4-D. CDAA, 2,4,5-T, MCPA, MCPB and dalapon were all ineffective against these 3 spp.—P.J.B.

928 Bayer, D. E. and Buchholtz, K. P. **Some factors affecting the germination of three species of smartweed.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 7–8. [Agron. Dep., Univ. Wisconsin, Madison]

Observations are made on the germination of *Polygonum pennsylvanicum*, *P. persicaria* and *P. lapathifolium*. Submerging the seed in water held at 2°C. for 4–6 weeks overcame primary dormancy and resulted in the highest germination percentages. Using 0·2% KNO_3 solutions resulted in slightly higher germination percentages than water, especially in the case of *P. lapathifolium*. Under conditions of alternating temperatures (20°C. for 16 hr. and 30°C. for 8 hr.), only *P. lapathifolium* showed marked increases in germination. Secondary dormancy was induced by exposing the seed to 30°C. in dry air for 24 hr.—P.J.B.

929 Sacco, J. da C. Observações sôbre *Sesbania punicea* (Cav.) Benth. **[Observations on**

Sesbania punicea.] *Bol. téc. 17 Inst. agron. Sul* 1957, 13–21, bibl. 11, illus.

A description is given of *Sesbania punicea*, a shrub which grows in the low, periodically-flooded fields of the Instituto Agronômico do Sul, Brazil. Information is given on its development throughout the year. Rice-fields with defective drainage present ideal conditions for the development of *S. punicea*, which is considered a potential weed of rice.—E.B.O.

930 Schmerbauch, R. P. and Slife, F. W. **Life history of Johnson grass plants developing from seed.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 29. [Univ. Illinois, Urbana]

Johnson grass [*Sorghum halepense*] seedlings emerged about 5 days after sowing and early seedling growth was slow. Tillers and rhizome primordia were initiated at the 3-leaf stage (2 weeks old). At the 5-leaf stage, plant growth became very rapid and new rhizomes were initiated ; these rhizomes appeared to have non-dormant buds.—P.J.B.

931 Anderson, L. E. **A comparison of volumes of water in applying dalapon and erbon to Johnson grass.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 25–6. [Kansas Agric. Exp. Sta., Manhattan]

In trials to determine the effect of spray volume on the control of *Sorghum halepense* treated with erbon, dalapon or erbon + dalapon mixtures, rapidity of kill was closely correlated with spray volume. Volumes of 20 or 40 gal./ac. resulted in delayed weed kill, compared with 80 gal./ac. treatments, but the final degree of effectiveness was similar for all treatments.—P.J.B.

932 Monson, W. G. and Shafer, N. E. **Phenological and biochemical studies of bud dormancy in two deep rooted perennial weeds.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 11. [Univ. Nebraska, Lincoln]

In phenological studies during 2 years on *Vernonia baldwini* and *Euphorbia esula*, buds were present on both spp. throughout the year. New buds were initiated after growth began in spring and bud dormancy supervened during late summer and early autumn. Bud dormancy was broken by low temperatures during early winter. Observations are made on peroxidase and polyphenolase activities in these spp. during the growing season and early winter.—P.J.B.

933 Shafer, N. E. and Monson, W. G. **The role of gibberellic acid in overcoming bud dormancy in certain perennial weeds. 1. Leafy spurge and ironweed.** [Abstract] *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 12. [Univ. Nebraska, Lincoln]

Applications of GA as foliar sprays and in lanolin paste were made to *Vernonia baldwini* and *Euphorbia esula* in an attempt to activate dormant buds. *Vernonia baldwini* did not respond to any treatment. With *Euphorbia esula*, applying GA to the foliage or to exposed dormant buds stimulated bud growth and caused branching and the development of new shoots on old shoots. GA produced an effect similar to, but much greater than, that following the removal of apical dominance.—P.J.B.

934† O'Neil, J. M. **Noogoora burr, Californian burr, buffalo burr. These weeds must go.** *J. Dep. Agric. S. Aust.* 1958, **62**, No. 1, 7–11, illus.

Recommended spraying rates for control of Noogoora burr (*Xanthium pungens*), Californian burr (*X. californicum*) and Bathurst burr (*X. spinosum*) are 1 lb. a.e. 2,4-D or MCPA/ac., or a 0·1% solution for spot-spraying. For control of buffalo burr (*Solanum rostratum*) half the above rates are recommended. Pasture competition and cultivation are also useful control measures.—A.M.H.

935† Moja, A. and Spreafico, L. La lotta contro le erbe infestanti. Rilievi sulla moltiplicazione agamica in *Artemisia vulgaris* L. [**Weed control. Observations on agamic multiplication in *Artemisia vulgaris*.**] *Ann. Sper. agr.* 1958, **12**, No. 4, 1265–81, bibl. 7, illus., English summary. [Ist. Agron., Univ. Milano, Italy]

Information is given on vegetative reproduction in mugwort (*A. vulgaris*). [See also *Fld Crop Abstr.* 10 : 1168.]—E.B.O.

936 Jensen, L. A. and Helgeson, E. A. **Perennial weed control.** *Circ. A-194* (*Revised*) *N. Dakota Agric. Coll. Ext. Serv.* 1957, pp. 4.

Practices recommended for the eradication of Canada thistle [*Cirsium arvense*], sowthistle [*Sonchus arvensis*], creeping jenny [*Convolvulus arvensis*], leafy spurge [*Euphorbia esula*], Russian knapweed [*Centaurea repens*] and perennial peppergrass [*Cardaria draba*] are : (a) growing Sudan grass, millet or buckwheat (*Fagopyrum esculentum*) as a smother-crop and cultivating the soil 4 in. deep before and after sowing ; (b) cultivation until September, sowing winter rye and applying 2,4-D at 0·5 to 0·75 lb./ac. when weed growth is vigorous ; (c) cultivation for 1 yr. followed by spring wheat or barley sprayed with 0·5 lb. 2,4-D/ac. before the crop becomes sensitive to the herbicide ; (d) sowing *Bromus inermis* and spraying with 1 lb. 2,4-D/ac. at the onset of flowering for *C. arvensis*, or in spring and autumn for *C. repens* and *E. esula*, or mowing to control thistles. Cultivation over a 2-yr. period when *C. arvensis*, *E. esula* and *C. draba* are 4 in. tall, or every 2 weeks in the case of *C. repens*, eradicates these weeds. Applying 2,4-D in spring hastens eradication. Applying 4–6 lb. aminotriazole in 30 gal. water/ac. to *Cirsium arvense* immediately before flower-buds appear, or during regrowth after mowing, is recommended.—R.B.

937 COMMUN, R.-L. Lutte chimique contre les mauvaises herbes dans l'Outre-mer. [**Chemical weed control in Overseas France.**] *Agron. trop., Nogent* 1958, **13**, No. 3, 361–79, bibl. 25.

This paper brings together recommendations on chemical weed control in Overseas France, with particular reference to weeds in maize, sorghum, rice, groundnuts and cotton, and on control of *Eichhornia crassipes*, *Imperata cylindrica*, *Digitaria scalarum*, *Cyperus rotundus*, shrubs and trees. A list is given of some of the weeds present in Overseas France (scientific, English and French names.)—E.B.O.

938† MCCREATH, J. B. and FORREST, J. D. **Bracken control. Machinery trials—West Perthshire 1952-55.** *Res. Bull. 24 W. Scot. Agric. Coll.* 1958, pp. 31, bibl. 6.

The operating costs and efficiency of 4 machines for bracken control, and the density and height of bracken after treatment with each, were compared. After 4 yr. (3 double treatments and 1 single treatment), the bracken density was reduced from 18–36 to 4–7 fronds/sq. yd., and its height from 27 to 6 in. The rate of recovery of the bracken after bruising was faster than after cutting. Where bracken was previously very dense, with little or no herbage, a typical *Festuca/Agrostis* sward became established after treatment. The economic aspects of the trials are discussed.—A.M.H.

939† IVENS, G. W. **The effects of arboricides on East African trees and shrubs. 1. *Acacia* species.** *Trop. Agric., Trin.* 1958, **35**, No. 4, 257–71, bibl. 21. [Colonial Pesticides Res. Unit, Arusha, Tanganyika]

A series of experiments is described in which 2,4-D and 2,4,5-T were tested on several *Acacia* spp. In most of the trials ester formulations of the chemicals were used, dissolved in diesel oil and applied as basal-bark sprays. The results suggested that the above-ground parts of most *Acacia* spp. can be killed in this way. In the larger spp. little or no regeneration occurred. In the smaller spp., e.g. *A. hebecladoides*, more regeneration occurred, but this was considerably reduced by the more effective treatments, notably 1% 2,4,5-T in diesel oil, applied without frilling of the bark. A climbing sp., *A. pennata*, regenerated very vigorously and satisfactory control could not be achieved with a single oil-based spray. In general, 2,4,5-T was more effective than 2,4-D. Increases in concentration above 1–2% a.e. gave little additional effect and 0·5% was frequently sufficient. Frilling the bark was apparently not necessary with the smaller trees, but greatly increased the effectiveness of the spray on larger trees, e.g. *A. nigrescens*. In spp. where regrowth occurred, the best results were obtained by applying the arboricide during a period of active growth.—A.M.H.

940† GAY, P. A. ***Eichhornia crassipes* in the Nile of the Sudan.** *Nature, Lond.* 1958, **182**, No. 4634, 538–9, bibl. 1. [Bot. Dep., Univ. Khartoum, Sudan]

The spread of this plant in various reaches of the river is recorded, and factors affecting distribution of the weed are discussed.—M.H.

941† WILSON-JONES, K. **Aquatic weed control.** *Span* 1958, No. 3, 26–9, bibl. 8, illus.

The problem of weed infestation of drainage and irrigation channels is discussed and mechanical, biological and chemical control measures are described, with particular reference to tropical conditions.—A.M.H.

942 WESTMORLAND, W. G. **Witchweed : its characteristics and the North Carolina situation.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 21. [N. Carolina State Coll., Raleigh]

A note is given on the characteristics and occurrence in N. Carolina of *Striga asiatica*.—P.J.B.

943 RAWAT, V. S. and AMBASHT, R. S. **Root relations of *Orobanche* [*cernua*] and its hosts.** *Curr. Sci.* 1958, **27**, No. 11, 445–6. [Hindu Univ., Varanasi, 5, India]

944† HOPP, Hanna. Untersuchungen über die Lebensdauer von Unkrautsamen mit neueren Methoden. [**A study of the longevity of weed seeds, using new methods.**] *Thesis, Landw. Hochsch. Hohenheim* 1957, pp. 72, bibl. 25, illus. [Inst. PflSchutz, Landw. Hochsch. Hohenheim, Stuttgart, W. Germany]

945† LOKTEV, N. N. **The dispersion of seeds of certain weeds by the seeds of *Bromus secalinus* L.** [Russian] *Bot. Ž. (Bot. J. USSR)* 1958, **43**, No. 9, 1314–16, illus. [All-Union Inst. Pl. Ind., Leningrad]

The seed of this grass is distinguishable from other grass seeds by certain morphological features, one of which is the deep groove which extends throughout the length of the seed. The width of the groove varies in different specimens from a fraction of a mm. to 2 mm. The author maintains that this feature not only enables the seed to survive in unfavourable conditions, but also facilitates the dispersal of other weed seeds which lodge in the groove. Cleaned winter rye grains usually contain 3–4% adulteration with *B. secalinus* which may, itself, carry other small seeds of noxious weeds. The significance of this in regard to seed analysis and quarantine regulations is indicated.—M.H.

946† MINARIK, C. E. **Future chemicals for weed control.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 1–5. [Biol. Warfare Labs, Fort Detrick, Frederick, Maryland]

A review is given of research on the more recently-produced herbicides, their uses and effectiveness against different weed spp.—P.J.B.

947† Crafts, A. S. **Studies on translocated herbicides.** *Span* 1958, No. 3, 5–11, bibl. 2, illus.

The use of herbicides labelled with radioactive tracers for studying the mechanism of translocation of herbicides in plants and the comparative mobility of different herbicides, are discussed.—A.M.H.

948 Spurrier, E. C. and others. **A study of spray techniques to increase the effectiveness of various pre-emergence herbicides.** *Proc. 14th N. Cent. Weed Contr. Conf.* [*USA*] 1957, 27–8. [Univ. Illinois, Urbana]

The results are given of trials with different application techniques for CDAA for controlling grass weeds. The herbicide was applied at 4 lb./ac. in 20 gal. water in bands 10 in. wide. Spray pressures of 30–40 lb. sq. in. were satisfactory and a nozzle height of 10 in. above the ground gave better results than 6 in. above the ground. Incorporating CDAA and EPTC into the soil surface gave better weed control than applying it to the undisturbed soil ; this effect was much more marked with EPTC than CDAA.—P.J.B.

949 Stryckers, J. Onderzoekingen naar de toepassingsmogelijkheden van synthetische groeistoffen als selektieve herbiciden in grasland en akkerbouwgewassen. [**The applicability of synthetic growth regulators as selective herbicides in grassland and field crops**]. *Proefschr. LandbHogesch. Gent* 1958, pp. 197, bibl. 505, photographs 76, mimeo.

The period of comparative dormancy occurring in cereal crops between the end of tillering and the onset of flowering was a favourable time for the application of phenoxyacetic herbicides, especially MCPA. Winter cereals were less susceptible than spring cereals to damage by these herbicides ; oats were the most and barley the least susceptible. Winter cereals should be at least 20 cm. tall, and spring cereals 25 cm. tall, in order to escape herbicidal damage ; oats should have a main stem bearing at least 5–6 leaves before being sprayed. Maize was least susceptible to phenoxyacetic herbicides when < 15 cm. tall ; 2,4-D amine at 0·6–1 kg./ha., only, should be used on this crop. Some potato varieties withstood spraying with 0·5–1 kg. MCPA/ha., but only when treated at an early stage of growth. NaMCPA at < 400 g./ha. could be used on fibre-flax plants when they were 5- to 10-cm. tall only and under conditions not favouring rapid growth. Beet were very susceptible to all phenoxyacetic herbicides. MCPB was the most useful herbicide in cereals with undersown legumes, and could be used on peas or field beans before flower-buds appeared. MCPB (400–600 g./ha.) was safer than MCPA for fibre flax but was unsuitable for beet or potatoes. MCPP damaged all legumes, except *Trifolium pratense*, when used on their cereal cover-crop. 2,4,5-TP could be used for localized application against *Tussilago farfara* in cereals without undersown legumes. Propham could be used to advantage as a pre-sowing treatment for peas. Both propham and CIPC were fatal to flax. TCA and dalapon gave good control of perennial grasses ; dalapon was the better, and it controlled *Polygonum amphibium*, also ; it was not advisable to apply dalapon after December if any spring cereal (except maize), potatoes or fodder-beet were to be grown. F. concl.—R.B.

SURVEYS AND LAND USE

SURVEYS

950 Roberts, E. **The county of Anglesey. Soils and agriculture.** *Mem. Soil Surv. Gt Britain* 1958, pp. viii + 116, bibl. 47, illus., 10 maps, London : H.M.S.O., 10s.

A brief account is given of the topography and climate of Anglesey ; the geology and soil types of the area are dealt with in more detail. The history of agriculture in the county is briefly traced. The acreages under crops and grass and livestock numbers are tabulated for each year from 1939 to 1953. In 1953, the total area under crops and grass was about 134,000 ac., of which about 52,000 ac. was arable land. The area of permanent grass has been increasing since 1945, but has not reached the pre-war figure of about 105,000 ac. The area of clovers and temporary grass has almost doubled since 1939, and that of rough grazings is thought to be reaching a minimum at about 20,000 ac. The geology, soil types and agriculture of a small part of Caernarvonshire are also briefly described. —A.M.H.

951 De Fina, A. L. and Garbosky, A. J. Difusión geográfica de cultivos índices en la provincia de La Pampa y sus causas. [**Geographical distribution of index crops in La Pampa province and its causes.**] *Publ. 58 Sec. Agric. Ganad. Argentina* 1958, pp. 31, maps.

This work is part of an agro-ecological survey of Argentina [see *Fld Crop Abstr.* 10 : 1550]. The localities surveyed in La Pampa during 1944–56 numbered 64. Cotton is virtually not grown in La Pampa, maize is grown in 58 localities, wheat in 56, oats in 54 and barley in 55.—E.B.O.

LAND USE

See also Abs. 1055, 1078

952† Guillaume, A. Économie rurale de l'Océanie Française. (Esquisse de développe-

ment agricole). [**Rural economy in French Oceania. An outline of agricultural development.**] *Agron. trop., Nogent* 1958, **13**, No. 3, 279–99 and No. 4, 448–57, illus.

The first 2 parts of this study, which results from a mission to French Oceania in Aug.-Nov., 1955, give information on the climate, economics and land utilization in that territory, which consists of 125 small islands.—E.B.O.

953† Best, R. H. **An evaluation of British land-use statistics.** *The Chartered Surveyor* 1958, June (*Repr. 119 Wye College, nr Ashford, Kent*) pp. 4, bibl. 10.

954† Royal Commission on Common Land [England and Wales], 1955–1958. **Report.** 1958, pp. viii + 284, bibl. in text, illus., 2 maps, London : H.M.S.O., 14s.

LAND RECLAMATION

955 Knabe, W. Beiträge zur Bibliographie über Wiederurbarmachung von Bergbauflächen. [**Bibliography on reclaiming mined areas.**] *Wissen. Z. Humboldt-Univ. Berlin* 1957/8, **7**, No. 2, 291–304, Russian, English and French summaries.

The vast majority of the papers in this bibliography of 206 items were published between 1950 and '57. The lists are given geographically, and the largest number of papers is in the German section. There is a useful, tabulated analysis of numbered references, the classifications being type of waste land, country, and 10 separate aspects of the subject. Information on sources of further literature is requested.—D.B.

956† Lyerly, P. J. and Longenecker, D. E. **Salinity control in irrigation agriculture.** *Bull. 876 Texas Agric. Exp. Sta.* 1957, pp. 20, bibl. 21, illus.

The relative tolerance of field crops and grasses to Na and B is given, and procedures for reclaiming saline soils are described. Notes are given on the uses of saline water for irrigation purposes.—R.B.

957 Funaioli, U. Alcuni aspetti della bonifica di Bulo Mererta (Basso Uebi Scebeli-Somalia). [**Some aspects of land reclamation at Bulo Mererta (Lower Webbe Shibeli-Somaliland).**] *Riv. Agric. subtrop.* 1958, **52**, No. 7–9, 355–79, bibl. 7, illus., English summary.

Information is given on the reclamation of about 25,000 ha. at Bulo Mererta, Benadir, which were previously subject to flooding and are now a fertile, irrigated area giving good yields of maize, sesame and beans.—E.B.O.

958† Bulletin de Madagascar. Aménagement agricole de la Sakay par le B.D.P.A. [**Agricultural management of the Sakay region (Madagascar) by the B.D.P.A.**] *Bull. Madagascar* 1958, **8**, No. 147, 677–92, illus.

In the Sakay region of Madagascar, grassland is the only form of vegetation present ; its use for grazing is dependent on burning. Rainfall is 1700 mm. from Nov. to Apr. Maize, cassava and beans are grown near the villages. This article is concerned with proposals for the agricultural management of about 15,000 ha. of such land, one-third of which only is suitable for cultivation.—E.B.O.

FARMING SYSTEMS AND PRACTICES

See also Abs. 603

959† Terra, G. J. A. **Farm systems in South-east Asia.** *Neth. J. agric. Sci.* 1958, **6**, No. 3, 157–82, bibl. 50, illus.

Indonesian farming systems are discussed.—R.B.

960 Noläng, R. En västmanlandsgård med noggran växtodlingskontroll. **A farm in Västmanland with a careful control of plant cultivation.** *Växt-närings-Nytt* 1958, **14**, No. 4, 11–19, illus., English summary.

A description is given of the farming system practised on a 95-ha. (70 ha. arable + 25 ha. woodland) farm in the Västmanland Province of Sweden. Since 1950, the farm has carried no livestock and about 68% of the area is under cereal crops, 24% under winter turnip rape [*Brassica campestris* var. *oleifera* subvar. *biennis*] and spring rape [*B. napus* var. *oleifera* subvar. *annua*] and 8% under peas. Details are given of the cropping systems for 1954 and '55 and method of crop recording used.—P.J.B.

961† Candura, G. La meccanizzazione nella trasformazione dell'agricoltura dell'Italia meridionale. [**Mechanization in transforming agriculture in southern Italy.**] *Atti Cent. naz. mecc. agric., Torino* 1956–7, **2**, 97–110, illus., English, French and German summaries.

Some of the most important problems of agricultural mechanization in Italy are examined. Particular aspects considered are ploughing-depth, combine-harvesting and land management. F.s.—E.B.O.

962 Rees, A. M. M. **An economic survey of the Plateau Tonga [N. Rhodesia] improved farmers.** *Agric. Bull. 14 Dep. Agric. N. Rhod.* 1958, pp. 72.

This bulletin is complementary to that mentioned in *Fld Crop Abstr.* 11 : 1276. A brief account is given of the African Improved Farming Scheme.

Improved farms are graded according to the standard of husbandry demanded and the consequent acreage bonuses paid. On Grade A farms, only half the land may be cropped with maize, while the rest grows legumes ; half of the legume crop must be ploughed-in as green manure ; the maize following the green manure crop must receive artificial fertilizers, while that following the reaped legume crop must receive kraal manure. Requirements for Grade B farms are similar, except that the use of artificial fertilizers on the maize is not compulsory and all of the legume crop may be reaped. Bonuses paid per ac. in 1954–5 were 27s. for Grade A and 17s. for Grade B. The size of the family and farm labour force, and the status, age, experience and non-farming interests of the improved farmer are discussed in relation to the grade of farm. The acreage farmed increased with the size of family. Yields of maize were variable, but generally very low. The average per acre was 2·8 bags [1 bag = 200 lb.] on improved land and 1·0 bag in private gardens farmed by traditional methods, compared with 7 bags on European farms in N. Rhodesia, in the same season. The level of capital investment in land improvement, machinery, implements and livestock is discussed. When expressed in terms of total value of maize production, the relative financial positions of unimproved, Grade A and Grade B farms depended on maize yield/ac. Comparing three 10-ac. holdings, at yields of 2 bags maize/ac. and below, the Grade A farm would give the highest return from maize, but at higher yield levels the unimproved farms would give the highest return. However, when the income from leguminous crops and the levels of maize yields to be expected on the 3 types of farm are considered, the improved farms show a considerable financial advantage. There was a tendency for farm income to increase with size of holding, with a maximum at 30–40 ac. It also increased with yield of maize/ac., in spite of an inverse relationship between yield/ac. and acreage planted to maize. Profit per farm in 1954–5 averaged £52 on A farms, £35 on B farms and £47 over all farms surveyed. It is concluded that the level of yields obtained is unsatisfactory, considering the good husbandry practices which have to be adopted by members of the scheme. The need for greater emphasis on economic aspects in land-use planning for African farming areas is stressed.—A.M.H.

963† Nye, P. H. **The relative importance of fallows and soils in storing plant nutrients in Ghana.** *J.W. Afr. Sci. Ass.* 1958, **4**, No. 1, 31–49, bibl. 8.

The nutrient content of some of the main types of natural vegetation in Ghana and the soils supporting them are described. Some planted fallows and leguminous cover crops are similarly dealt with.—C.L.S.

964† Reid, I. G. **The small farm on heavy land.** *Dep. Agric. Econ., Wye Coll.* 1958, pp. 31, bibl. in text, illus., 1 map.

This report deals with farming in the Weald of S.E. England, where dairy farming at low profit levels is predominant. The reasons for the low profitability are analysed and alternative systems suggested.—A.M.H.

965 Blunt, C. F. **Arable farming on Romney Marsh.** *Agriculture, Lond.* 1958, **65**, No. 7, 350–3.

966 Division of Land Research and Regional Survey, Commonwealth Scientific and Industrial Research Organization, Australia. **Katherine Research Station [Northern Territory].** *Rep. C.S.I.R.O. 1956–7*, Canberra, 1957, 70–1. [Received Sept., 1958]

Deep ploughing in the dry season again gave higher sorghum and groundnut yields than shallow dry-season ploughing or deep ploughing after the beginning of the rains. Comparison of methods for cotton establishment favoured harrowing and rolling after ploughing. Late sowings gave better stands than early ones. Sorghum yields following cotton and groundnuts were higher than after sorghum. [See also Abs. 483.]—A.M.H.

967 Department of Agriculture, Nyasaland. **A summary of some aspects of agricultural experimental work, 1957/58. Long term rotation experiments.** *Nyasald Fmr For.* 1958, **4**, No. 3, 6.

At Chitedze, yields are being maintained without fertilizer in a rotation of a leguminous green manure crop with either 2 maize crops, or 2 maize crops and 1 groundnut crop. Application of 5 tons farmyard manure and compost/ac. was not sufficient to maintain yields of continuous maize at the level of 20 bags/ac. [? 1 bag = 200 lb.] obtained from virgin soil. After 3 yr., yields fell to 14 bags/ac. and there were visual responses to the organic manures and to ammonium sulphate at 75 lb./ac. At Mbawa, 5 tons farmyard manure/ac. maintained yields of continuous maize at about 10 bags/ac., especially where supported by a dressing of 75 lb. ammonium sulphate/ac. A rotation experiment based on bush fallow gave yields of 1–2 bags maize/ac., without fertilizer, and 4–5 bags/ac., when 100 lb. ammonium sulphate was applied and the maize alternated with groundnuts, but overall yields have fallen progressively.—A.M.H.

968 Tanganyika Agricultural Corporation. **Rotation experiment.** *Rep. Tanganyika agric. Corp. 1956–7*, Dar-es-Salaam, 1958, 52. [Exp. Fm, Urambo]

Yields of groundnuts in 1955–6 were 1514 lb. kernels/ac. following a 2-yr. Rhodes grass [*Chloris gayana*] ley (rotation A) and 1232 lb./ac. following

2 yr. of velvet beans [*Stizolobium* sp.] (rotation B). In 1956–7 soyabean yields were 1168 lb./ac. in rotation A and 1160 lb./ac. in rotation B.—A.M.H.

969 Kondo, G. and others. **Studies on the improvement of upland farm cropping. Growth and yield of succeeding summer crops influenced by the kind of preceding winter crops. 2. Growth of succeeding summer crops on soil with cropping of different preceding winter crops.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1958, **26,** No. 3, 222–3, and 224, English summaries. [Aichi Agric. Exp. Sta.]

Sweet-potato and millet gave highest yields when grown after common vetch as the preceding winter crop. Rape was also a good preceding crop, but not wheat or naked barley. Rice grew best after common vetch. Pot experiments confirmed the results of field tests. The relationship between these results and soil nutrients was studied. F. Eng. s.—D.B.

970† Blair, E. Nivelación de tierras para riego. [**Soil levelling for irrigation (in Peru).**] *Agronomía, Lima* 1958, **25,** No. 92, 5–33, bibl. 6, illus.

971† Renfro, G. M., Jr. **Applying water under the surface of the ground.** *Australas. Irrig. and Past. Imp.* 1958, **3,** No. 9, 11–15.

The principles of sub-irrigation are discussed, with special reference to the San Luis Valley, Colorado and the Florida Coastal Plain. Details are given of the procedure used in sub-irrigating improved pastures.—A.M.H.

972 Mohrmann, J. C. J. Irrigation par aspersion. Aspects agricoles, techniques et économiques. [**Sprinkler irrigation. Agricultural, technical and economic aspects.**] *Bull. agric. Congo belge* 1958, **49,** No. 4, 877–921, bibl. 39, illus., Flemish summary. [Sta. Rech. Agron. INÉAC, Mvuazi, Belgian Congo]

Irrigation allows sowing to be done at the most convenient time and extends the growing season. Irrigation permits 3 food crops to be grown per year on the best soils in the Belgian Congo. It is also of value for cotton and groundnuts. The advantages and disadvantages of sprinkler irrigation compared to other types of irrigation are examined, the choice being dependent on local conditions. General information is given on irrigation in the Belgian Congo, mainly with regard to sprinkler irrigation. The equipment for sprinkler irrigation, and the economics of this system, are also considered.—E.B.O.

973† Rego, Z. J. P. C. and Estácio, F. L. F. Determinação das necessidades de água para rega. [**Determination of water requirements for irrigation.**] *Rev. agron., Lisboa* 1957, **40,** 31–47, bibl. 17. [Received Oct., 1958]

The subject is reviewed and discussed.—E.B.O.

974† Bobčenko, V. I. [**Subterranean drain irrigation and the effect of artificial drains on the soil and plants.**] [Russian] [Contained in] Biological bases of irrigation farming. Moscow, 1957, pp. 91–104. [Received Aug., 1958] [All-Union Sci. Res. Inst. Hydrotech.]

There is information on the increase in yields obtained from several crops (including oats, vetch/oat mixture, wheat and sugar-beet) when grown by drain irrigation compared with controls without irrigation. The increases amount to 35–40% (in wheat) when the crops also receive autumn/winter precipitation. [See Abs. 877.]—M.H.

975 †Jackson, D. C. **Some preliminary indications of soil moisture changes under arable crops.** *Rhod. agric. J.* 1958, **55,** No. 4, 426–38, bibl. 4, illus. [Henderson Res. Sta., S. Rhodesia]

Soil-moisture contents at 1, 3 and 5 ft. depths under various crop systems were measured using electrical resistance blocks. The crop systems were : continuous maize, at high- and low-levels of fertility ; alternate green-manure crop (*Crotalaria juncea*) and maize ; long ley rotations of star grass (*Cynodon plectostachyus*) and Napier fodder (*Pennisetum purpureum*). The soil moisture changes over the period March 1955 to Feb. 1957 are charted. The relatively high water usage by Napier fohder and star grass is noted.—A.M.H.

976 Tanganyika Agricultural Corporation. **Soil fertility.** *Rep. Tanganyika agric. Corp. 1956–7,* Dar-es-Salaam, 1958, 29–32. [Exp. Fm, Nachingwea]

In fertilizer experiments begun in 1954, average responses to annual applications of 100 lb. single superphosphate/ac. in 1954–7 were : 201 lb./ac. for maize ; 345 lb./ac. for sorghum ; 86 lb./ac. for groundnuts ; 121 lb./ac. for soyabeans. Responses to a second 100 lb. superphosphate/ac. were 38, 124, 32 and −16 lb./ac., respectively, for the 4 crops. Responses to the first 100 lb. ammonium sulphate/ac. were : maize, 418 lb./ac.; sorghum, 205 lb./ac. ; to the second 100 lb., maize, 268 lb./ac. ; sorghum, 109 lb./ac. Residual responses to N by groundnuts and soyabeans in the following year were negligible. Maize showed residual responses of about 600 and 1100 lb./ac. to 5 and 10 tons dung/ac. applied in the previous year. In a ley experiment, a 2- or 3-yr. fallow under Rhodes grass [*Chloris gayana*] had no effect on subsequent groundnut yields, but affected maize yields. When the maize received single superphosphate and ammonium sulphate, the first crop was unaffected by fallowing, the second was increased by 17% and the third was increased by 34%. In the absence of fertilizers, the increases were 29%, 20% and 10% in the 1st, 2nd and 3rd years, respectively. —A.M.H.

977† Corby, H. D. L. **Grasslands Research**

Station, Marandellas. Work with soil fertility. *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1957*, Salisbury, 1958, 50–1.

On sandveld soil, the residual effects of 5-yr. Star grass [*Cynodon* sp.] leys, fertilized in various ways, were assessed by a test crop of maize which received no fertilizers. Where lime had been applied to the ley each year, the yield of maize was much greater than where no lime was applied. Large amounts of ammonium sulphate applied to the ley reduced maize yields ; lime countered this effect. There were no apparent residual effects of P and K. Maize yielded 4·5 bags/ac. [1 bag = 200 lb.] more when the ley was ploughed in mid-March than when it was ploughed in mid-Jan. Maize grown without fertilizers, as the 1st crop after a well-fertilized Star grass ley, yielded 26 bags/ac. The 2nd unfertilized maize crop yielded 18 bags/ac. and required 250 lb. ammonium sulphate/ac. to raise the yield to 26 bags.—A.M.H.

978 Sivaraman, M. S. **If each field grows its manure.** *Internat. Rice Comm. News Lett.* 1958, **7**, No. 3, 8–13. [Planning Comm., New Delhi, India]

Nitrogen deficiency is a main factor limiting crop production in India. Of the various sources of N, green manures and composts have great possibilities. So far, less than 10% of the cultivated area has benefited from them, the main reason being the inadequate seed supply. Results from trials showed that green manures could raise the yields of rice and wheat by 20–40%. Trials in Madras, in particular, showed that the increase in rice yield by the use of green manures is cumulative until an average of 2500–3000 lb. of paddy per ac. is reached, as against the average for India of 1100 lb./ac. The following species are suitable for green manure cropping or for compost making : *Sesbania speciosa*, *S. aegyptiaca*, *Ipomoea carnea*, *Gliricidia* sp., *Indigofera teysmanni* and *Pongamia glabra*.—E.B.O.

979† Turner, R. and others. **The use of liquid manure on farms.** *Dep. Agric. Scotland* 1958, pp. 32, illus., Edinburgh : H.M.S.O., 2s. 6d.

The manurial value of liquid manure and methods for its conservation are discussed. Its application to grassland and its injection into the soil for arable crops are mentioned. The equipment for its collection, storage and distribution is described. The economics of the subject are discussed with reference to 1957 prices.—A.M.H.

980† Dawes, S. N. **Crop establishment by chemical destruction of turf.** *Proc. 11th N.Z. Weed Contr. Conf.* 1958, 109–15, bibl. 2. [Dep. Agric., Wellington, N.Z.]

The method for growing crops by direct sowing into chemically-killed turf, though still experimental and carried out mostly with *Brassica* crops, is promising. It could simplify and cheapen the growing of field crops. The best results were obtained under high-fertility conditions, but when ample fertilizer is used, there is indication that the method can be extended to low-fertility areas. F. s.—M.H.

981 George, E. J. **Shelterbelts for the Northern Great Plains.** *Fmrs' Bull. 2109 U.S. Dep. Agric.* 1957, pp. 16, illus. [N. Great Plains Fld Sta., Mandan, N. Dakota]

SOIL AND WATER CONSERVATION

982 Ryan, F. E. **Pyp grass (*Ehrharta villosa*).** *J. Dep. Agric. W. Aust.* 1958, **7**, No. 4, 437–8, illus.

Pyp grass has been useful for sand-binding on coastal sand dunes in some areas.—A.M.H.

983† Australian Academy of Science. **A report on the condition of the high mountain catchments of New South Wales and Victoria.** 1957, pp. 62, bibl. 54, 2 maps, Canberra : Australian Academy of Science. [Received Sept., 1958]

Soil erosion and catchment efficiency, and the causes and agents of erosion in the Australian high-mountain catchments, are briefly discussed. An account is given of the severity of erosion and deterioration of the vegetative cover, and the relative importance of the agencies concerned, based on statements from State and Federal organizations, on the personal knowledge and inspections of the investigating committee and on published work. The present system of administration in the area is described. It is concluded that there is a serious risk of accelerated soil erosion, unless the catchments are properly managed. Recommendations made were : (a) that the catchment areas should be brought under the control of a single conservation authority in each state ; (b) that grazing above 4500 ft. should be prohibited ; (c) that the possibility of continuing grazing below 4500 ft. should be investigated ; (d) that burning should be prohibited and fire precautions in the areas improved ; (e) that constructional work at altitudes above 6000 ft. should be limited to that essential to an efficient irrigation scheme. Management and present land-use in the high-mountain catchments, and estimates of the value of the Snowy Mountain catchment, are discussed in appendices.—A.M.H.

984† Morton, J. D. **The storage and abstraction of water conserved in sand**

rivers in the Gwanda district. *Rhod. agric. J.* 1958, **55,** No. 4, 399–406, bibl. 4, illus.

Data are given on the rates of evaporation of water from open water surfaces and from saturated sand. The theory of the extraction of water from sand storage and the availability of water under such conditions are discussed. Practical methods for extraction are described.—A.M.H.

985† Edwards, J. A. **Storing water in farm dams.** *J. Dep. Agric. S. Aust.* 1958, **62,** No. 2, 86–96, bibl. 4, illus.

Aspects discussed are : the choice of site ; the storage ratio (volume of water stored/volume of earth excavated) ; the economics of dam construction for various purposes ; the condition of the catchment area and the use of roaded or corrugated-iron catchments ; suitable foundations and bank materials ; the construction of spillways ; siting a turkey's nest [ring] dam ; design and stages in construction of earth dams ; sealing leaking dams.—A.M.H.

AGRICULTURAL METEOROLOGY AND CLIMATOLOGY

See also Abs. 1060, 1075

986 Glover, J. and Kenworthy, J. M. **Effect of altitude on temperature and dew point.** *Rep. E. Afr. agric., for. Res. Org. 1957,* Nairobi, [n.d.], pp. 18–19. [Received Sept., 1958]

Mean annual temperatures and mean annual dew points were both closely related to altitude, with, on the average, the mean temperature only 10°F. above the dew point. This relationship allows a rough estimate to be made of the duration of potentially damp conditions at stations where only temperature is recorded.—A.M.H.

987† Podol'skiĭ, A. S. **A new method of phenological prognoses and agroclimatic estimations from the thermal factor.** [Russian] *Doklady Akad. Nauk, SSSR (Proc. Acad. Sci. USSR)* 1958, **121,** No. 5, 932–5.

988† Pelton, W. L. **Potential evapotranspiration estimates by the Penman and Thornthwaite methods.** *Diss. Abstr.* 1958, **19,** No. 4, 614–5. [Univ. Wisconsin, Madison]

Evapotranspiration from grass was measured by the heat budget method on 31 days in 1956 and 17 in 1957 and the results used to compare the Penman and Thornthwaite methods for estimating daily potential evapotranspiration. Correlations between estimates according to the Penman method were consistently close. There was evidence that net radiation (a measure of the available energy) was the most important parameter in evapotranspiration. Though the Penman method gave results which were closely correlated with potential crop evapotranspiration, it underestimated the actual quantities of potential evapotranspiration. The Penman wind function did not appear to account adequately for surface roughness and required amendment. There was evidence that very little evapotranspiration occurred at night (in lucerne) and that Penman's stomatal and daylight factors did not seem necessary. The Penman method did not appear to account fully for the sensible heat flux either into or out of the surface. Despite these deficiencies, the Penman method gave reasonably good estimates of evapotranspiration, even on a daily basis, provided that good estimates of daily net radiation were used and corrections for surface roughness made. It was concluded that calculations using the Thornthwaite method, mean air temperature, or diurnal range of air temperatures, could not provide an accurate estimate of daily potential evapotranspiration, and that no method which did not embody factors for net radiation could be of practical use in agriculture.—P.J.B.

989† Baker, D. G. **A comparison of two evapotranspiration calculation methods and the application of one to determine some climatic differences between great soil groups of Minnesota.** *Diss. Abstr.* 1958, **19,** No. 4, 611–12. [Univ. Minnesota, Minneapolis 14]

In the first part of these studies, comparisons were made of the Thornthwaite and Penman methods for calculating evapotranspiration. Variations of these formulae were used, embodying daily and monthly meteorological parameters ; also, two values for Penman's constant were compared. It was concluded that: (a) average monthly meteorological parameters and daily values were equally effective ; (b) the Thornthwaite method, based on average monthly temperatures, was equal or superior, to the Penman method ; (c) a constant of 0·8 was better than 0·7 for use with the Penman method ; (d) the Thornthwaite "book keeping" procedure for measuring soil moisture compared favourably with field-moisture determinations over a 12-month period.—P.J.B.

990† Raadsma, S. **Some methods of determining evapotranspiration.** *Publ. FAO/58/5/3887* 1958, pp. 16, bibl. 40. [Dar-es-Salaam, Tanganyika]

The current literature on evapotranspiration is reviewed and an attempt is made to evaluate the methods employed for measuring the water consumed by plants. The conclusion is drawn that the Gunn-Bellani Radiation Integrator is a simple and accurate instrument for determining evapotranspiration ; its use is recommended.—E.B.O.

991† Allison, F. E. and others. **Relationship between evapotranspiration and yields of crops grown in lysimeters receiving natural rainfall.** *Agron. J.* 1958, **50**, No. 9, 506–11, bibl. 8. [Soil and Water Conserv. Res. Div., U.S. Dep. Agric., Beltsville, Maryland]

Evapotranspiration and crop-yield data were obtained in 2 experiments, lasting 5 and 7 years, respectively, in which crops of maize, cotton, pearl millet (*Pennisetum glaucum*), cowpeas, soya-beans and *Crotalaria* sp. were grown in lysimeters in sand receiving varying quantities of NPK fertilizers. Additional crops of rye, oats, barley, vetch and peas were grown on some lysimeters during the winter months in order to keep the sand covered with vegetation. Except during extreme drought, no irrigation was given. Maximum evapotranspiration in the 2 experiments was 28 and 32 in./yr., whereas evaporation from bare soil was 16 in./yr. There was a high positive correlation between evapotranspiration and dry weight of the crop, irrespective of the level of fertilization or the crop rotation used. The most efficient use of water occurred in the rotations in which the soil supported vegetation for the greatest proportion of the year. There were differences of 9·5–12 in. of water/yr. in the evapotranspiration of the different crop sequences, but differences of <4 in./yr. between the highest and lowest fertility levels of each crop. The great increase in yield from increased fertilization, compared with the small increase in evapotranspiration, resulted in greater efficiency of water-use. F. s.—r.b.

992† Wind Hzn, R. **The lysimeters in the Netherlands.** *Versl. Meded. 3 Comm. Hydrol. Onderz. T.N.O.* 1958, 165–228, illus., French and Esperanto summaries. [Comm. Hydrol. Onderz. T.N.O., 's-Gravenhage, Netherlands]

A detailed description is given of the lysimeter installations in the Netherlands. Evapotranspiration data covering the years 1919–54 are given for a variety of grasses and field crops.—r.b.

993† Chiung, Lü. **The duration of daylight, civil twilightand astronomical twilight. (A brief discussion of their relations to plant life.)** [Chinese] *Acta Agric. sinica* 1958, **9**, No. 2, 192–7, bibl. 3, illus.

994† Garnier, B. J. **The climate of New Zealand.** 1958, pp. 191, illus., London : Edward Arnold. [Reviewed in *Quart. J. roy. met. Soc.* 1958, **84**, No. 362.]

995† Kendrew, W. G. and Currie, B. W. **The climate of central Canada.** 1955, pp. ix + 194, illus., Ottawa : Queen's Printer and Controller of Stationery. [Seen in *Quart. J. roy. met. Soc.* 1958, **84**, No. 362.]

996† Kendrew, W. G. and Kerr, D. **The climate of British Columbia and the Yukon Territory.** 1955, pp. x + 222, illus., Ottawa : Queen's Printer and Controller of Stationery. [Reviewed in *Quart. J. roy. met. Soc.* 1958, **84**, No. 362.]

997† Department of Agriculture, British Columbia. **Climate of British Columbia. Tables of temperatures, precipitation and sunshine. Report for 1957.** 1958, pp. 42. [Met. Branch, Air. Serv. Div., Dep. Transport, Gonzales Observatory, Victoria, B.C.]

998† Institut National pour l'Étude Agronomique du Congo Belge. Bulletin climatologique annuel du Congo belge et du Ruanda Urundi, anneé 1957. [**Annual climatological bulletin of the Belgian Congo and Ruanda-Urundi, 1957.**] *Comm. 16 Bur. Climatol. INÉAC* 1958, pp. 177. [Bruxelles]

MISCELLANEOUS

999† Ministry of Agriculture, Fisheries and Food, England and Wales. **Agricultural statistics 1956/57, England and Wales. Agricultural censuses and production for 1956/57, together with prices and index numbers for 1955 and 1956.** 1958, pp. 170, London : H.M.S.O.

1000† Ministry of Agriculture, Fisheries and Food, England and Wales, Department of Agriculture for Scotland and Ministry of Agriculture, Northern Ireland. **Output and utilization of farm produce in the United Kingdom 1946-47 to 1955-56.** 1958, pp. iv + 51, London : H.M.S.O., 4s. 6d.

1001† Sykes, J. D. **The recession in farm profits in South-east England.** *Fm Mgmt Survey Rep. 8, Dep. Agric. Econ., Wye Coll.* 1958, pp. 28, bibl. in text.

Profits per ac. on a group of about 170 farms in Kent, Surrey and Sussex averaged £3 12s. in 1956–7, compared with £5 18s. in 1955–6. Profits of farms of less than 100 ac. fell to about one-fifth of the 1955–6 level, while those of larger farms were about seven-eighths of the 1955–6 level. F. s.—a.m.h.

1002† Department of Agricultural Economics, Nottingham University. **Farming in the East Midlands. Financial results 1957-58.** *Fmr's Rep. 140 Dep. Agric. Econ., Nott. Univ.* 1958, pp. 31.

1003† Elstrand, E. En sammenlikning av drifts-

granskingene på danske og norske gårdsbruk. [**A comparison of the economics of Danish and Norwegian farms.**] *Tidsskr. Norsk Landbr.* 1958, **65**, No. 10, 267–74.

The farm economies of Norway and Denmark for 1956–7 are compared on the basis of data of costings and returns for 1000 farms in each country, compiled by the respective Bureaux of Agricultural Economics in Norway and Denmark. Data are given of : crop yields and acreages, the prices of various commodities sold off the farm and of purchased commodities, farm costings and incomes. —P.J.B.

1004† Friedrich, J. Entwicklung und Stand der Kultivierung von Moor und Ödland in Bayern and ihre Zukunft im gemeinsamen europäischen Markt. [**Development and present-day situation regarding the cultivation of peat-land and waste land in Bavaria and its future in the European Common Market.**] *Bayer. landw. Jahrb.* 1958, **35**, No. 3, 256–75, bibl. 9, illus. [Landesanst. f. Moorwirtschaft und Landkultur, München, W. Germany]

The paper deals with bringing waste land into cultivation to compensate for loss of agricultural land which is now used for other purposes. The subject is considered from the standpoint of agricultural economics.—D.B.

1005† Cooke, G. W. **The nation's plant food larder.** *J. Sci. Fd Agric.* 1958, **9**, No. 12, 761–72, bibl. 25.

The history of the use of N, P and K fertilizers in the UK is briefly reviewed. Approximate estimates are made of the amounts of nutrients in arable crops and grass grown in 1956 and the gains and losses of nutrients in that year. The balance sheet produced is compared with one published in 1874. The quantities of plant foods supplied by fertilizers since 1837 are discussed in relation to the amounts now present in the soil. Future prospects for increases in the use of fertilizer are examined. Most arable crops grown for sale are now receiving about as much fertilizer as can be justified, but more N is needed to grow full crops of cereals. Practically all crops grown for animal feeding are, on average, undermanured. Any major increase in the total amount of fertilizer used is likely to be achieved by better manuring of grassland.—A.M.H.

1006† National Agricultural Advisory Service, England and Wales and Rothamsted Experimental Station. **Survey of fertilizer practice 1957 (Part I).** 1958, pp. 39.

The districts surveyed included 5 mainly arable districts, 4 grassland districts in lowland England and 5 grassland districts in Wales and the English uplands. For each group of districts, the average amounts of fertilizer applied in 1957 and the estimated changes during 1953–7 are tabulated. For each district, the overall average rates of fertilizer application per ac. and the average actual rates applied to tillage crops, and temporary and permanent grass are given. In 1953–7 there was no material change in the use of P, a slight rise in its use on tillage crops being counterbalanced by a slight fall on grassland. There were substantial increases in the use of N and K on tillage crops in all districts, and on leys and permanent grass in the arable districts. Only small increases in fertilizer use on leys occurred in the grassland districts, but these increases formed a substantial percentage of the 1953 consumption on leys in these districts. Fertilizer use on permanent grass in these districts was virtually the same as in 1953. F. s.—A.M.H.

1007 Robertson, W. K. and others. **Effect of lime on some North Florida soils.** *Proc. Soil and Crop Sci. Soc. Fla* 1957, **17**, 72–85, bibl. 13. [Received Nov., 1958]

The results are given of experiments carried out on 4 soil types to test the effects of lime on the chemical properties of the soil and on crop yields. Lime generally increased yields of maize, groundnuts and soyabeans, but had no consistent effect on oats.—A.M.H.

1008† OEEC. **Farm management. Manual on the preparation of national and regional handbooks for use in farm management advisory work.** *Project 395/1 OEEC* 1958, pp. 155, 10s. 6d.

1009 Whitrow, Magda [Ed.] **Index to theses accepted for higher degrees in the Universities of Great Britain and Ireland. Vol. 6. 1955-56.** 1958, pp. xii + 165, 24 × 15 cm., London : Aslib, 25s.

The number of theses recorded in this volume is 2713. The following titles are among those of interest to readers of this journal : The forecasting, phenology and control of potato blight ; The effect of placement of fertilizer and cultivation upon the growth, yield and quality of main crop potatoes ; Cultural practices affecting the growth, yield and quality of main crop potatoes ; A study of the effects of cultivation on the growth and yield of the wheat crop. An analysis of the competition between barley and white persicaria.—C.L.S.

1010 University College of Wales, Aberystwyth. **Abstracts of summaries of theses presented by students in the Faculty of Agriculture 1957.** *J. agric. Soc. Univ. Coll. Wales* 1958, **39**, 33–5.

Theses presented include : Studies on the growing and utilization of the kale crop, by N. Bounds ; Studies on the growth of certain cereals on seed-beds prepared by dry sieving of the soil, by R. S. Edwards [see *Fld Crop Abstr.* 11 : 164 and 586 and Abs. 586].—A.M.H.

1011 Ebert, D. and Schnee, M. Zum Problem der Erntetechnik im Feldversuchswesen. Einzelpflanzen- und Reihenernte. [**Harvesting technique in field experimentation. Harvesting by individual plants and by rows.**] *Z. landw. Vers. u. UntersuchWes.* 1957, **3**, No. 3, 245–67, bibl. 3, Russian and English summaries. [Inst. Landw. Versuchs- u. Untersuchungswesen, Leipzig, E. Germany]

For the purposes of yield trials, the advantages of row-harvesting of beet- and cereal-crops compared with random selection of individual plants is discussed from the standpoint of labour, use of machinery and calculating time for statistical analysis. When the soil is uniform and edge effects are absent, row-harvesting from the centre of the plot gives results as reliable as those obtained by random selection of single plants, with less expenditure of time on statistical calculations.—D.B.

1012 Oliveira, A. J. de. **Analysis of a group of experiments on oats. 1. Complete data.** *Agron. lusit.* 1957, **19**, No. 4, 329–56, bibl. 13, Portuguese summary. [Iowa Agric. Exp. Sta., Ames]

A method is presented for estimating the average response and its reliability, applicable to groups of trials employing the same treatments or varieties, but using different experimental designs and different numbers of replications. Data from a series of varietal trials with oats during 1950–4 were used to illustrate the calculations of average responses and respective standard errors. F. s.—E.B.O.

1013† Sváb, J. Überlegungen zu methodischen Fragen der Grossflächenversuche. [**Methodology in large-scale trials.**] *Z. landw. Vers. u. UntersuchWes.* 1957, **3**, No. 3, 268–78, bibl. 3, Kussian and English summaries. [Landesanst. Sortenprüfung, Budapest, Hungary]

Questions concerning large-scale varietal trials carried out on several experimental farms in Hungary are discussed. They include plot size (from 3–5 ha. to 8–10 ha.), replication of a variety (between farms but not within farms), and statistical evaluation of results.—D.B.

1014† Mauldon, R. G. **An introduction to the application of linear programming to farming problems.** *J. Aust. Inst. agric. Sci.* 1958, **24**, No. 3, 191–8, bibl. 22.

1015† Noble, Mary J. and others. **An annotated list of seed-borne diseases.** *Proc. internat. Seed Test. Ass.* 1959, **24**, No. 1, 1–159. [Commonwealth Mycol. Inst., Kew]

This list is arranged in order of crop genera and gives brief details of the more important seed-borne pathogens of plants of economic importance within the genera. References to pathogens in the *Review of Applied Mycology* and certain other publications on seed pathology are given, with, where known, details of the geographical distribution, mode of infection and control of specific pathogens.—P.J.B.

1016 Brentzel, W. E. and Jensen, L. A. **Crop diseases.** *Circ. A-291 N. Dakota Agric. Coll. Ext. Serv.*, pp. 12, illus.

Symptoms of attack by fungal, bacterial and virus diseases in wheat, barley, oats, rye, maize, flax and soyabeans, together with recommended control measures, are given in tabular form.—R.B.

1017 Ministry of Agriculture, Fisheries and Food, England and Wales. **Wireworms.** *Adv. Leafl. 199 Minist. Agric., Fish., Fd, England and Wales*, 1958, pp. 6.

Recommended measures for control of *Agriotes lineatus, A. obscurus, A. sputator* and *Athous haemorrhoidalis* in cereals or root crops following pasture are : ploughing infested pasture in Feb. or March and fallowing, rather than ploughing in July, with good consolidation of the seed bed ; dressing cereal- or sugar-beet-seed with γ-BHC or dieldrin; soil treatment with aldrin or γ-BHC dust (0·5 cwt./ac. drilled with the seed or 1·5–2 cwt./ac. worked-in before sowing) or with 2·5 lb. aldrin/ac. as a low-volume spray.—A.M.H.

1018† Satchell, J. E. **Earthworm biology and soil fertility.** *Soils and Ferts* 1958, **21**, No. 4, 209–19, bibl. 188. [Nature Conservancy, Merlewood Res. Sta., Grange-over-Sands, Lancs.]

The effects of earthworms on crop yields, structure and chemistry of soils and the effects of cultivation, fertilizers and toxic chemicals on earthworm populations are reviewed.—A.M.H.

1019† Graf, A. Massnahmen zur Verhütung von Mäuseschäden im Feldbau. [**Measures for preventing agricultural damage by mice.**] *Mitt. schweiz. Landw.* 1958, **6**, No. 4, 49–60, illus. [Eidg. Landw. Versuchsanstalt, Zürich-Oerlikon]

The habits of, damage caused by, and measures for controlling mice, voles and moles are described.—D.B.

1020† East Africa High Commission. **Regional research programmes 1958/1959. Agriculture, Animal Industry, Animal Disease, Forestry.** Nairobi, 1958, pp. 83.

This publication gives details of the approved programmes of research being carried out by the East African Government Departments and High Commission, commodity research stations, certain commercial firms and Makerere College. It indicates, where possible, the relative importance of certain studies and gives a brief summary of progress in some lines of research.—A.M.H.

1021 Reyntens, H. and others. Rijksstation voor

Plantenveredeling, Lemberge (Melle). Beknopt aktiviteits-overzicht 1947–56. [**Short review of activities at the Plant Breeding Station at Lemberge (Melle) [Belgium], 1947-56.**] *Het Wetenschappelijk Onderzoek in de Landbouw* 1958, Pt. 1, 35–50, bibl. 55, illus.

This report contains notes on varieties of field crops recently developed at the Belgian Plant Breeding Station.—R.B.

1022† Wye College, University of London. **Guide to the Department of Agriculture and College Farm.** 1958, pp. 57, 1 map. [Wye College, nr. Ashford, Kent]

1023† West African Standing Advisory Committee. **Agricultural and forestry research workers in West Africa.** [n.d.], v + 54.

REPORTS

1024 **Great Britain.** Department of Scientific and Industrial Research. Pest Infestation Research 1957. The report of the Pest Infestation Board with the report of the Director of Pest Infestation Research. 1958, pp. 55, illus., London: H.M.S.O., 5s.

See Abstracts 579, 611, and 646.

1025† **Great Britain.** Committee for Colonial Agriculture, Animal Health and Forestry Research. Thirteenth Annual Report. 1957–8. London, 1958, pp. 17–132.

1026 **Great Britain.** Hasler and Co. Ltd., Essex. Eighth and Ninth Reports on Trial and Experimental Work carried out at Throws, Little Dunmow, 1955–6 and 1956–7. By P. R. Hayward, [n.d.], pp. 48. [Received July, 1958]

See Abstracts 551 and 740.

1027 **Great Britain.** National Institute of Agricultural Botany. Thirty-eighth Report and Accounts, 1957. Cambridge, [n.d.], pp. 56, illus. [Received July, 1958]

See Abstracts 703, 741 and 796.

1028 **Great Britain.** National Institute of Agricultural Engineering. Annual Report 1956–57. Silsoe, Beds, [n.d.], pp. 72 + supplement pp. 18, bibl. 58, illus. [Received July, 1958]

See Abstracts 580 and 588.

1029 **Great Britain.** Norfolk Agricultural Station. Fiftieth Annual Report, 1957–58. Sprowston, 1958, pp. 22, illus.

See Abstracts 576, 732 and 752.

1030 **Northern Ireland.** The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland, 1957, Vol. 7. Belfast, 1958, pp. 286, 12s. 6d.

See Abstracts 765 and 800.

1031 **Spain.** Estación de Riegos de Córdoba. 2. Memoria-resumen de trabajos realizados 1953–1956. [2. Summary report on work at the Córdoba Station for Irrigation (Spain) during 1953–6.] *An. Inst. nac. Invest. agron.* 1957, **6**, No. 4, 299–388.

See Abstracts 625, 854 and 855.

1032 **Algeria.** Gouvernement Général, Inspection Générale de l'Agriculture. Rapport du Conseil de l'Expérimentation et des Recherches Agronomiques pour 1955. [Report of the Council for Agronomic Experimentation and Research for 1955.] Alger, 1957, pp. 269.

See Abstract 559.

1033 **Aden Protectorate.** Empire Cotton Growing Corporation. Progress Reports from experiment stations. Season 1957–58. Aden Protectorate. London, 1958, pp. 20.

See Abstract 848.

1034 **East Africa.** East African Agriculture and Forestry Research Organisation. Annual Report, 1957. Record of Research for the period 1st July, 1956 to 31st December, 1957. Nairobi, [n.d.], pp. 112. [Received September, 1958]

See Abstracts 635 and 986.

1035 **Uganda.** Empire Cotton Growing Corporation. Progress Reports from Experiment Stations. Season 1957–58. Uganda. London, 1958, pp. 67. [Cott. Res. Sta., Namulonge and Serere]

See Abstracts 820-3, 831, 835, 841, 842.

1036 **Tanganyika.** Agricultural Corporation. Report and accounts for 1956–1957. Dar-es-Salaam, 1958, pp. 137, illus., 1 map.

See Abstracts 615, 718, 723, 968 and 976.

1037 **Federation of Rhodesia and Nyasaland.** Secretary to the Federal Ministry of Agriculture which includes the Departments of Research and Specialist Services, Conservation and Extension Services, Veterinary Services, and Tsetse and Trypanosomiasis Control and Reclamation. Report for the year ended 30th September, 1957. Salisbury, 1958, pp. 178.

See Abstracts 617, 643, 824, 836 and 977.

1038 **West Africa.** West African Rice Research Station, Rokupr, Sierra Leone. Annual Report for 1957. London : Crown Agents for Overseas Governments and Administrations, 1958, pp. 29, illus., 2s.

See Abstracts 671.

1039 **India.** Indian Central Jute Committee. Annual Report of the Jute Agricultural Research Institute, 1956–57. Calcutta, 1958, pp. 121.
See Abstracts 856 and 859.

1040 **Australia.** Commonwealth Scientific and Industrial Research Organization. Ninth Annual Report for the year 1956–57. Canberra, 1957, pp. 179, 10s. 6d. [Received Sept., 1958]
See Abstracts 595, 610, 926 and 966.

1041 **South Australia.** Waite Agricultural Research Institute. Report, 1956–1957. University of Adelaide, [n.d.], pp. 60, illus. [Received Jan., 1959]
See Abstracts 547, 609 and 612.

1042 **New South Wales.** Department of Agriculture. Report for the year ended 30th June, 1957. Sydney, 1958, pp. 110.
See Abstracts 651, 924 and 1084.

1043 **British Guiana.** Director of Agriculture. Annual Report for the year 1956. British Guiana, [n.d.], pp. 66 + iii. [Received August, 1958]
See Abstracts 663 and 857.

1044 **Guatemala.** Ministerio de Agricultura. Servicio Cooperativo Interamericano de Agricultura. Informe anual — 1957. [Annual report for 1957.] [n.d.], pp. 192, illus.
See Abstracts 558 and 616.

1045 **Canada.** Quebec Society for the Protection of Plants. Thirty-ninth report, 1957. 1958, pp. 113, illus.
See Abstracts 655 and 785.

BOOKS

1046 Kijak, G. S. [**Spring wheat.**] [Russian] 1957, pp. 184, bibl. 138, illus., 15 × 23 cm., Kiev, Acad. Sci. Ukrainian SSR, 7 roubles, 45 kopeks. [Received Feb., 1959]

At the 22nd Congress of the Political Party in the USSR it was announced that, in the 6th Five-year Plan, the production of grain by 1960 should amount to 11 million poods [1 pood = 36 lb.]. In 1939, spring wheat (the primary grain crop in the Union) was sown on more than 27 million ha., which comprised almost half the area under this crop in the whole world. This area has, subsequently, been considerably extended by the cultivation of waste lands and by other schemes for land reclamation. The author has studied the development of spring-wheat production in the Western Ukraine, and supplies information on : the history, future prospects and soil/climate relationships of spring-wheat production in Western Ukraine ; the biological peculiarities of old varieties of spring wheat ; results of State varietal trials with spring wheat during 1948–55 ; spring wheat in crop rotations ; and cultural measures, including control of diseases and pests.—M.H.

1047 Laverton, Sylvia. [Ed.] **Fisons cereals book.** 1957, pp. 47, illus., 21 × 16 cm., Felixstowe, Suffolk: Fisons Ltd. [Received November, 1958]

The facts and advice given in this booklet refer to cereal-growing in the UK. Among the aspects dealt with are : varieties ; factors affecting quality ; the sowing, cultivating and manuring of wheat, barley, oats and rye ; and pests and diseases.—C.L.S.

1048 Pearson, E. O. **Insect pests of cotton in tropical Africa.** 1958, pp. x + 355, bibl. 686, illus., 3 maps, 26·5 × 18 cm., London : Empire Cotton Growing Corporation and Commonwealth Institute of Entomology, 40s.

" This book is concerned with the insects that are associated with cotton in Africa south of the Sahara. Its object is not only to give an account of them that will be useful to those concerned with the welfare of the cotton crop, who are not entomologists, but also to provide the specialist working on African cotton-pest problems with a critical summary of the available information." There is a short introductory section on cotton-growing in tropical Africa covering the botany of the cotton plant, its introduction and cultivation and a description of the principal cotton-growing areas. There follows a general account of the systematic and geographical distribution of insects associated with cotton, the type of damage they cause, their effects on yield and their relative importance in the different cotton-growing areas. A key to the principal disorders of cotton in Africa is given, intended primarily for field use. The major part of the book is devoted to descriptions of individual species of insect pests and mites. An appendix describes the use of insecticides on cotton in Africa. The illustrations are in colour and there is a subject and species index.—A.M.H.

1049† Hey, G. L. and Marshall, K. **The control of pests and diseases in agricultural and horticultural crops.** 1958, pp. 172, bibl. 17, illus., 19 × 12·5 cm., London : Vinton and Co., Ltd., 12s. 6d.

This book aims to provide students, farmers, growers and gardeners with a guide to the control of the more important pests and diseases of horticultural and agricultural crops. The emphasis is on control and only brief details of the life histories

of a few pests and diseases are given. There are chapters on the control of pests and diseases by cultural, mechanical, biological and chemical methods, the last including insecticides, fungicides, soil sterilants and seed dressings. Brief descriptions are given of the chemicals concerned, the pests or diseases controlled by them and the formulations and rates normally used. An account is given of spraying and dusting machines for outdoor and glasshouse crops. There is a short glossary of common and scientific names of pests and diseases. An index is provided.—A.M.H.

1050† MARTIN, H. **The scientific principles of crop protection.** 4th edn, 1959, pp. viii + 359, bibl. to individual chaps, 23·5 × 15 cm., London: Edward Arnold, Ltd., 65s.

Since those directly concerned with crop protection are generally biologists, it is assumed that they will be better acquainted with the biological than with the physico-chemical aspects of pest and disease control. The emphasis of this book is therefore on the latter aspects, but this does not imply that they are regarded as of greater importance than biological and cultural control methods. Reviews of these methods, with extensive bibliographies, are given. Practical details of methods of insecticide and fungicide application are not mentioned, except where they provide useful examples, as they vary considerably with local conditions. The present edition follows the plan of the 3rd, published in 1940, except that the great extension of the range of chemicals available for crop protection since that date, and the expansion of knowledge of the mechanisms of toxic action, now permit a co-ordinated treatment and discussion of general principles before their specific application to the several groups of pesticides. As in previous editions, there are comprehensive subject and author indexes.—A.M.H.

1051† LHOSTE, J. Les désherbants chimiques. [**Chemical herbicides.**] 1958, pp. 84, 27 × 21 cm., Paris : Off. Rech. Sci. Tech. Outremer.

This is a review of chemical herbicides which are grouped thus : inorganic preparations, mineral oils, and organic preparations (by far the largest group). The information given on particular herbicides includes : principal uses ; recommended rates ; and effects on weeds and crops. Lists are given of : susceptible species ; herbicides produced in France ; scientific and English names of plant species.—E.B.O.

1052† CLAPHAM, A. R. and others. **Flora of the British Isles. Illustrations. Part 1. Pteridophyta-Papilionaceae.** Drawings by Sybil J. Roles. 1957, pp. vi + 144, illus., 29 × 21·5 cm., Cambridge University Press, 25s. [Received Dec., 1958]

These illustrations are intended as a companion to the Flora of the British Isles [*Fld Crop Abstr.* 5 : 1374]. The arrangement of species follows the order in the Flora, but not all the species described there are illustrated. The drawings are intended primarily to show the general appearance of the living plant and no attempt has been made to give large-scale drawings of all parts of the plant. It is intended that the illustrations should eventually appear in 4 volumes.—A.M.H.

1053† ROBYNS, W. Flore du Congo Belge et du Ruanda-Urundi. Spermatophytes. Tableau analytique des familles. [**Flora of the Belgian Congo and Ruanda-Urundi. Spermatophytes. Analytical table of families.**] 1958, pp. 69, bibl. 8, 25 × 16 cm., Bruxelles : INÉAC.

A key is given for the identification of 189 families of native, or naturalized, species. There is an index of scientific names. [See *Fld Crop Abstr.* 12 : 526.]—E.B.O.

1054† STEWARD, A. N. **Manual of vascular plants of the lower Yangtze Valley, China.** 1958, pp. 635, bibl., illus., 26 × 18 cm., Corvallis : Oregon State College.

This work is the fruition of a co-operative effort on the part of many workers in China and America. It begins with a key to the families and aberrant genera of the Pteridophyta and Spermatophyta. The main part of the book consists of a key to, and descriptions of, species of Pteridophyta, Gymnospermae and Angiospermae. Chinese names, as well as English ones, are given. The book concludes with lists of botanical authors of plant names and of abbreviations to reference works, a botanical glossary which also gives the terms in Chinese, and a plant index.—D.B.

1055† YAPP, W. B. and WATSON, D. J. [Ed.] **The biological productivity of Britain. Symposia of the Institute of Biology, No. 7.** 1958, pp. vii + 128, bibl. to individual papers, 1 map, 22 × 14 cm., London : Institute of Biology, 25s.

This symposium included the following papers: The land-use pattern of Britain, by L. Dudley Stamp ; The recent history of land-use, by G. P. Wibberley ; Factors limiting production, by D. J. Watson ; Present agricultural production, by H. G. Sanders ; Improvements in crop production, by G. D. H. Bell ; Water control for increased crop production, by H. L. Penman ; The future of British uplands, by J. B. Cragg ; Unconventional production of foodstuffs, by N. W. Pirie.—A.M.H.

1056† SANDERS, H. G. **An outline of British crop husbandry.** 3rd edn, 1958, pp. viii + 346, illus., 22 × 14 cm., Cambridge University Press, 35s.

The steady improvement in methods of arable

farming during recent years has called for a further complete revision of this well-known text book. In particular, the nomenclature of chemical fertilizers has been brought into line with current practice. The arrangement of the 1st and 2nd editions has been retained. Technical details are treated under the main operations : manuring, cleaning, tillage, preparing the seedbed, choosing and sowing seed, after-cultivation, and harvesting of cereals, peas, beans and root crops. Systems of rotation are discussed in a preliminary chapter. The grass crop is referred to only incidentally, since so many details of its husbandry are peculiar to itself. The short bibliography formerly given at the end of each chapter has been discontinued in this edition. —A.M.H.

1057 RANDHAWA, M. S. **Agriculture and animal husbandry in India.** 1958, pp. xvi + 364, bibl. 239, illus., 54 maps, 28·5 × 21 cm., New Delhi : Indian Council of Agricultural Research, Rs. 15.

This compilation is " expected to serve as a standard work of reference for all those who are interested in Indian agriculture and its development." Much care has gone into the collection of the information it contains and most of the 50 chapters have been vetted by Indian experts. The result is a broad outline picture of the diversity of India and its agriculture. The picture is, however, more in the nature of an X-ray photograph clearly revealing the skeletal bones upholding the agricultural structure of the country but revealing little more than the shadows of the anatomy itself.

The opening Section I entitled " The Land " constitutes an excellent introduction and includes a chapter on climate, in addition to those on geology and soils. In this broad survey attention is rightly focussed on the monsoons and their effect on rainfall distribution. " In India the success of agriculture, which is the main industry of the people, depends on the monsoon rains " and maps are given showing the normal dates of onset and withdrawal of the south-west monsoon for different parts of the sub-continent. An interesting chart shows the incidence of floods and droughts by areas from 1875 to 1949 and it is a distressing thought that countrywide droughts, with their resulting famine and distress, occur about once every 20 years. Descriptions are given of some of the main vegetation types and 5 main agricultural regions are listed. At the end of Section I, a summary is given of the major irrigation works.

Section II is devoted to crops and it is here that the agricultural economist will be pleased with what he reads, but the agriculturalist will be disappointed. It is understandable that, within the wide range of climate and peoples which India encompasses, it is difficult to provide detailed agricultural information. On the other hand, one is left with the feeling that many of the crops are summarily dealt with. Wheat, for example, occupies 29 million acres but is dismissed in two pages of text of which more than half is devoted to improved varieties. The grass crop, and grassland improvement are not mentioned. It is sincerely to be hoped that this section on crops, which is well written and well illustrated, will be much amplified in subsequent editions, so that the agronomy of the crops, including farm processing and storage, can be more fully covered. If this could be done it would admittedly result in a bigger book but it would be a more useful work of reference.

Statistical tables, a selected bibliography and an index are provided. In future issues, it would be a help to those dealing with Indian agricultural literature if a table giving the vernacular names of the annual crops in the different States could be included.—C. L. Skidmore.

1058† EXTERMANN, R. C. [Ed.] **Radioisotopes in scientific research. Vol. 4. Research with radioisotopes in plant biology and some general problems.** *Proc. Internat. Conf. UNESCO, Paris 1957*, 1958, pp. xxi + 690, bibl. at ends of papers, English, French, Spanish and Russian summaries, 26 × 17 cm., London : Pergamon Press, Ltd., £7.

1059† UNITED NATIONS TERMINOLOGY SECTION. **Atomic energy, glossary of technical terms.** [English, French, Spanish and Russian] 4th edn, 1958, pp. xii + 215, 28 × 21·5 cm., New York : U.N., 28s.

1060† TAYLOR, J. A. and YATES, R. A. **British weather in maps.** 1958, pp. xiv + 256, bibl. 45, illus., numerous maps, 22 × 14 cm., London : Macmillan and Co. Ltd., 21s.

1061† MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, ENGLAND AND WALES. **Manures and fertilizers.** *Bull. 36 Minist. Agric., Fish., Fd, England and Wales.* 11th edn, 1957, pp. iv + 104, London : H.M.S.O., 4s. 6d. [Received September, 1958]

1062† PEARCE, D. G. **Farm business management.** 1958, pp. xv + 122, bibl. 14, 22 × 14 cm., London and Edinburgh : Oliver and Boyd, Ltd., 15s.

1063† HARVEY, N. **Farm work study.** 1958, pp. xii + 86, illus., 19 × 13 cm., London : Farmer and Stock-breeder Publications, Ltd., 8s. 6d.

1064 HINE, H. J. **Machines on the farm.** 1959, pp. 224, illus., 23 × 16 cm., London : Odhams Press Ltd., 25s.

NEWS AND NOTES

Great Britain

1065† The Tropical Products Institute will become one of the research stations of the Department of Scientific and Industrial Research with effect from 1 April 1959. It will thus come under the control of the Lord President of the Council and be able to cater for the needs of countries in the Commonwealth which have recently achieved independence and which now no longer come within the scope of the Colonial Office.

The main objective of the Institute will continue to be the improvement of the economic life of the underdeveloped territories of the tropics, primarily those that form part of the British Commonwealth. The aim will be to improve the technology of existing industries and to introduce new ones as a result of research into new uses for tropical plant and animal products. [See also *Fld Crop Abstr.* 11 : 1876.]—C.L.S.

1066 The 1958–9 Sugar-Beet Crop surpassed all previous records. The total quantity to reach the factories was 5,741,869 tons representing a yield of 13·88 tons per acre. *Fmr and Stk-Breed.*, 24 Feb. 1959.—C.L.S.

1067 Changes in Proteins and Amino Acids during the Life-Cycle in Barley. This was the title of a paper by B. F. Folkes presented at a meeting of the Agriculture Group of the Society of Chemical Industry, held in London in Oct., 1958. It reviewed some of the work on the N metabolism of barley carried out at Bristol. Changes in the nature of the constituent proteins take place chiefly at germination and at seed formation. The proteins of barley grains are quite different from those of the vegetative parts. The protein metabolism during seed formation is considered to be largely a reversal of that occurring during germination. *Chem. and Industr.* 6th Dec., 1958.—E.B.O.

Belgium

1068† Seed Exchange. Seeds, including those of many grasses and legumes, are offered in exchange by the Jardin Botanique de l'État, Bruxelles (1958 list). *Suppl. Bull. Jard. bot., Brux. 1958.*—E.B.O.

Germany

1069 Barn-Storage of Potatoes. A series of illustrated articles on this subject has been contributed to *Kartoffelbau* Sept. and Oct. 1958. They deal with the construction, ventilation, mechanical equipment, capacity and costs of types of potato barn in various parts of N.W. Germany, in Bavaria, the Netherlands and S. Tyrol. The types vary, e.g. an inexpensive but suitably equipped shed, a large factory-like building, or a model barn designed to fit in with its surroundings. Many of the buildings described are constructed for storing grain, vegetables or fruit, as well as potatoes.—D.B.

Denmark

1070 The Eleventh Course on Danish Agriculture will be held at the Lyngby Agricultural College, Hillerød, Denmark, from 7–24 July, 1959. The course includes 14 lectures (in English) on various aspects of arable and grassland farming and animal husbandry. Numerous visits are planned to farms, experiment stations, research institutes and factories. One day will be spent in Sweden. Particulars are available from the Danish Institute, 3 Doune Terrace, Edinburgh 3.—A.G.G.H.

Italy

1071 The Wheat Area has been reduced by 6% during the past 20 years (it averaged 4,818,700 ha. in the years 1953–6) while yields per ha. have considerably increased. A further reduction in the wheat area, and a corresponding increase in the area under forage and other crops, is contemplated. This reduction is taking place mainly in mountain areas, best utilized as grasslands and forests, and also in irrigated areas where hybrid maize gives higher economic returns than wheat. *Ital. agric.* 1958, **95**, No. 10.—E.B.O.

1072 Rice. In a national competition, the rice variety Balilla Large Grain gave the record yield of 13,119 kg. (14·5% moisture) per ha. The methods by which this yield was obtained on a farm in Bologna province in 1958 are described in *G. Agric. Domen*, 23rd Nov., 1958.—E.B.O.

1073 Sugar Production in Sicily. In a report presented at a meting on the industrial development of Sicilian agriculture, held at Caltanisetta in April, 1958, information was given on the history, present situation, and possibilities of sugar-beet-growing in Sicily (autumn-sowing). It is estimated that the area under sugar-beet will soon be 40,000–50,000 ha., with a production of 1000–1500 million kg. of roots (18–20% sugar).—E.B.O.

Poland

1074 A Symposium on Fodder Plants was held at the Institute of Plant Breeding of the Polish Academy of Sciences from 25 to 28 June, 1958. The papers were devoted primarily to breeding, with special emphasis on the work with *Lupinus* spp. in Poland. This emphasis is considered to be the consequence of the impoverishment of the Polish light soils for which the growing of lupins is remedial. Among the data recorded there was information on : changes in winter vetch when sown in spring ; increase in the green-matter yields of beans, maize, wheat and other crops as a result of seed treatment with alkaloids ; correlations between peduncle diameter and resistance to pod shedding in *Lupinus* sp. ; the grouping of *Lupinus* spp. on the basis of alkaloid structure ; Swedish self-sufficiency in seed of fodder plants ; the production for N. European conditions of an early-maturing, thermo-neutral form of *L. albus* (Hadmerslebener early sweet Albus) ; and the paper-chromatography technique for analysing the lupin alkaloids, developed at the Polish Plant Breeding Institute.—From a report by P. S. Hudson.

Africa

1075† Mapping Projects under the auspices of the Commission for Technical Co-operation in Africa South of the Sahara (CCTA) include : (a) a climatological atlas of Africa consisting of approximately 65 maps. These will

appear in the following order : mean annual rainfall, monthly rainfall, humidity, and temperature ; (b) a botanical atlas of Africa; and (c) maps of regions in Africa where ecological conditions are favourable for the development of the water weed *Eichhornia crassipes*. *Publ. 32 CCTA/CSA* 1958.—E.B.O.

1076† Legumes in African Agriculture. A technical meeting on the use of legumes in agriculture and human nutrition was recently held at Bukavu, Belgian Congo, under the joint auspices of FAO and the Commission for Technical Co-operation in Africa South of the Sahara. A report of the meeting is shortly to be published in English, French and Spanish. *Nature, Lond.* 14 Feb., 1959.—M.H.

Republic of Sudan

1077 Water Hyacinth [*Eichhornia crassipes*] was seen for the first time in the Nile last winter. This weed is capable of moving upstream and already the Bahr El Gebel is said to be in danger of being blocked. Its appearance in the Blue Nile would be serious for the Gezira cotton-growing area. *World Crops* 1958, **10**, No. 12.—A.M.H.

West Africa

1078† Land-Use and Vegetation Survey of Central Gambia. This survey, based on information obtained from aerial photographs, is being published as a series of 35 maps on a scale of 1/25,000. The distribution of woodland, fallow bush, grass, groundnuts, sorghum, millets and other food crops, high and low mangrove, and marsh, is shown. The areas of rice cultivation in 1946 and 1956 are mapped. The maps are being used to determine whether the cultivation of swamp areas for rice since 1946 has increased the total acreage of rice grown in the Gambia, or whether it has merely replaced the cultivation of large upland areas for rice. Further information on the survey may be obtained from the Directorate of Overseas Surveys, Tolworth, Surbiton, Surrey. —A.M.H.

Belgian Congo

1079 Agricultural Research in Kivu. Information is given on the mountainous area of Kivu province (1000–2500 m.a.s.l., 0°–4° lat. S.), in particular on the organization of agricultural research there. Some results are given from trials to improve food crops, including potatoes, sweet-potatoes, cassava, groundnuts, maize, wheat and barley. *Bull. Inform. I.N.É.A.C.* 1958, **7**, No. 5.—E.B.O.

India

1080 Rabi Crops. In a supplement to *Indian Farming* Sept., 1958, brief, practical hints are given for raising yields of the important winter crops : wheat, barley, sorghum and gram. The hints deal with land preparation, choice of variety, seed treatment, time and method of sowing, manuring, cultivation, irrigation, weed and pest control.—D.B.

1081 Central Plant Protection Station at Amravati. Its functions will be : (1) to lend equipment and to supply plant-protection products at special cheap rates ; (2) to conduct surveys on all aspects of disease incidence, its causes and control ; (3) to evaluate plant protection products and machinery ; (4) to give practical training ; (5) to provide an information service. *Farmer, Bombay* Sept., 1958.—D.B.

1082† A new Post-Graduate School of Agriculture was inaugurated in October, 1958, at the Indian Agricultural Research Institute, New Delhi (the Pusa Institute). The School was organized on the recommendation of the Indo-American Team on Agricultural Research and Education and has received generous aid from the Rockefeller Foundation. *Indian Fmg*, Nov., 1958.—D.B.

Australia

1083† Seed Exchange. The CSIRO Seed Exchange List (1958) contains over 900 species of grasses, legumes and miscellaneous plants, the seeds of which are available from the Principal Plant Introduction Officer, Division of Plant Industry, CSIRO, P.O. Box 109, Canberra. Appendices list the varieties of sunflower, oats, barley, groundnuts, soyabeans, peas, cowpeas and sesame, for which seed can be supplied.—A.M.H.

1084 Aerial Reseeding of Rice. This was successfully carried out on a 60-ac. area at Yanco using pregerminated seed dusted with 1 oz. dieldrin/100 lb. seed, following destruction of the previous crop by bloodworms (Chironomideae). The crop reached maturity in 140 days, some 40 days less than normal for the variety. *Rep. Dep. Agric. N.S.W. 1957.*—A.M.H.

Argentina

1085† Weed Control. The control of the following weed species, which cause serious damage to agriculture and livestock, has been made compulsory : *Centaurea calcitrapa, C. melitensis, Ammi visnaga, A. majus, Carduus acanthoides, C. nutans* var. *macrocephalus, C. pycnocephalus, Cirsium vulgare, Onopordon acanthium, Xanthium spinosum, Conium maculatum, Diplotaxis tenuifolia, Chenopodium album, Ch. hircinum, Ch. murale, Ch. cordobense* and *Amaranthus hybridus* var. *quitensis*. *Rev. Fac. Agron., La Plata* 1957, **33**, No. 2.—E.B.O.

New Publications

1086 Excerpta Botanica. On the basis of a resolution passed at the 8th International Botanical Congress (1954), and with the co-operation of the International Association of Plant Taxonomists, it has been resolved to publish an international abstracting journal (*Excerpta Botanica*) covering the literature of systematic taxonomy and phytochorology. The journal will be published in two sections : (A) [10 issues p.a.] covering the fields of systematy, in a wide sense, and phytochorology, including specific fields such as phylogeny, taxonomical palaeobotany, taxonomical palynology, cytotaxonomy, etc., and a section B [4 issues p.a.] covering the literature of plant ecology and plant sociology. The publisher will be Gustav Fisher (Verlag), Stafflenbergstrasse 36, Stuttgart, from whom further details can be obtained. It is hoped that the journal will appear early in 1959.—M.H.

1087 Materiae Vegetabiles. Beginning with volume 3, the scope of this journal has been widened and its title changed to *Qualitas plantarum et materiae vegetabiles*. It con-

tains original papers on the genetics, biochemistry, physiology, ecology, culture and preparation of edible, medicinal and commercially useful plants.—R.B.

1088† Pest Technology, Pest Control and Pesticides is a new, monthly trade journal, intended for the publication of papers on all aspects of the investigation, use and manufacture of insecticides, fungicides and herbicides and on the control of such pests as rats, mice and birds. The journal is published by Rhodes Industrial Services, Ltd., 274–276, The Corn Exchange, Manchester 4, England, and the annual subscription is £3. 5s.—P.J.B.

Enquiries received

1089 Arising from enquires answered by the Bureau from December 1958 to February 1959, bibliographies on the following were prepared and are available on request from the Director : S.583. The effect of plant density on the yield (47 refs) and quality (4 refs) of cotton ; S.588. Depth of germinations of weed seeds. (8 refs) ; S.589. Vetches (*Vicia sativa*). (37 refs).—C.L.S.